
SSSSSSSSSSS YYY YYY SSSSSSSSSSS
SSSSSSSSSSS YYY YYY SSSSSSSSSSS
SSSSSSSSSSS YYY YYY SSSSSSSSSSS
SSS YYY YYY SSS
SSS YYY YYY SSS
SSS YYY YYY SSS
SSS YYY YYY SSS
SSS YYY YYY SSS
SSS YYY YYY SSS
SSSSSSSSS YYY SSSSSSSSS
SSSSSSSSS YYY SSSSSSSSS
SSSSSSSSS YYY SSSSSSSSS
SSS YYY SSS
SSS YYY SSS
SSS YYY SSS
SSS YYY SSS
SSS YYY SSS
SSS YYY SSS
SSSSSSSSSSS YYY SSSSSSSSSSS
SSSSSSSSSSS YYY SSSSSSSSSSS
SSSSSSSSSSS YYY SSSSSSSSSSS

```
  SSSSSSSS  YY      YY   SSSSSSSS  EEEEEEEEEE  NN      NN   QQQQQQ    DDDDDDDD   EEEEEEEEEE   QQQQQQ
  SSSSSSSS  YY      YY   SSSSSSSS  EEEEEEEEEE  NN      NN   QQQQQQ    DDDDDDDD   EEEEEEEEEE   QQQQQQ
SS          YY      YY  SS         EE          NN      NN  QQ      QQ  DD      DD  EE          QQ      QQ
SS          YY      YY  SS         EE          NN      NN  QQ      QQ  DD      DD  EE          QQ      QQ
SS            YY  YY    SS         EE          NNNN    NN  QQ      QQ  DD      DD  EE          QQ      QQ
SS            YY  YY    SS         EE          NNNN    NN  QQ      QQ  DD      DD  EE          QQ      QQ
  SSSSSS        YY        SSSSSS   EEEEEEEE    NN  NN  NN  QQ      QQ  DD      DD  EEEEEEEE    QQ      QQ
  SSSSSS        YY        SSSSSS   EEEEEEEE    NN  NN  NN  QQ      QQ  DD      DD  EEEEEEEE    QQ      QQ
        SS      YY              SS  EE          NN    NNNN  QQ  QQ  QQ  DD      DD  EE          QQ  QQ  QQ
        SS      YY              SS  EE          NN    NNNN  QQ  QQ  QQ  DD      DD  EE          QQ  QQ  QQ
        SS      YY              SS  EE          NN      NN  QQ    QQ    DD      DD  EE          QQ    QQ      ....
        SS      YY              SS  EE          NN      NN  QQ    QQ    DD      DD  EE          QQ    QQ      ....
SSSSSSSS        YY      SSSSSSSS   EEEEEEEEEE  NN      NN    QQQQ  QQ  DDDDDDDD   EEEEEEEEEE    QQQQ  QQ      ....
SSSSSSSS        YY      SSSSSSSS   EEEEEEEEEE  NN      NN    QQQQ  QQ  DDDDDDDD   EEEEEEEEEE    QQQQ  QQ      ....
```

```
LL              IIIIII      SSSSSSSS
LL              IIIIII      SSSSSSSS
LL                II      SS
LL                II      SS
LL                II      SS
LL                II      SS
LL                II        SSSSSS
LL                II        SSSSSS
LL                II              SS
LL                II              SS
LL                II              SS
LL                II              SS
LLLLLLLLLL      IIIIII    SSSSSSSS
LLLLLLLLLL      IIIIII    SSSSSSSS
```

Table of contents

```
0000     1          .TITLE  SYSENQDEQ - ENQUEUE/DEQUEUE SYSTEM SERVICES
0000     2          .IDENT  'V04-000'
0000     3
0000     4  ;****************************************************************************
0000     5  ;*                                                                          *
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0000    24  ;*                                                                          *
0000    25  ;****************************************************************************
0000    26
0000    27  ;++
0000    28  ; FACILITY: EXECUTIVE, SYSTEM SERVICES
0000    29  ;
0000    30  ; ABSTRACT:
0000    31  ;       This module implements the $ENQ, $ENQW, and $DEQ system services.
0000    32  ;
0000    33  ; ENVIRONMENT: VAX/VMS
0000    34  ;
0000    35  ; AUTHOR: Steve Beckhardt,       CREATION DATE: 30-Oct-1980
0000    36  ;
0000    37  ; MODIFIED BY:
0000    38  ;
0000    39  ;       V03-029 SRB0151         Steve Beckhardt                 21-Aug-1984
0000    40  ;               Fixed bug in "parent not granted" code to avoid spurious
0000    41  ;               errors.
0000    42  ;
0000    43  ;       V03-028 SRB0144         Steve Beckhardt                 9-Aug-1984
0000    44  ;               Fix broken branch.
0000    45  ;
0000    46  ;       V03-027 SRB0141         Steve Beckhardt                 6-Aug-1984
0000    47  ;               Changed the way system-owned locks are determined in
0000    48  ;               VERIFYLOCKID to remove race condition that gave incorrect
0000    49  ;               SS$_IVLOCKID errors.
0000    50  ;
0000    51  ;       V03-026 SRB0139         Steve Beckhardt                 24-Jul-1984
0000    52  ;               Added new entry point, LCK$CHECK_STALL to allow $GETLKI
0000    53  ;               (and others) to stall during state transitions.
0000    54  ;
0000    55  ;       V03-025 SRB0137         Steve Beckhardt                 11-Jul-1984
0000    56  ;               Remove race conditions from dequeue/all code.
0000    57  ;
```

```
0000     58 ;       V03-024 SRB0133         Steve Beckhardt                 22-Jun-1984
0000     59 ;               Fixed two bugs:  1)  Don't lose lock mode in conversion code
0000     60 ;               when an AST is already queued.  2)  Check CVTSYS bit of parent
0000     61 ;               lock when converting a lock to system owned instead of
0000     62 ;               looking for a zero PID.
0000     63 ;
0000     64 ;       V03-023 SRB0132         Steve Beckhardt                 25-May-1984
0000     65 ;               Allowed parent locks to be in CONVERT state when $ENQing
0000     66 ;               sublocks.
0000     67 ;
0000     68 ;       V03-022 SRB0126         Steve Beckhardt                 9-May-1984
0000     69 ;               Fixed bug whereby locks that were system owned that
0000     70 ;               were not successfully converted no longer had the
0000     71 ;               LCK$M_CVTSYS bit set.
0000     72 ;
0000     73 ;       V03-021 CWH3021         CW Hobbs                        14-Apr-1984
0000     74 ;               Fixed some broken branches.
0000     75 ;
0000     76 ;       V03-020 SRB0119         Steve Beckhardt                 6-Apr-1984
0000     77 ;               Changed access mode checking on lock ids.  Reorganized
0000     78 ;               code involved in cancelling conversions and fixed bug.
0000     79 ;               Added support for LCK$M_NODLCKWT flag.
0000     80 ;
0000     81 ;       V03-019 SRB0116         Steve Beckhardt                 8-Mar-1984
0000     82 ;               Return status code in LCK$DEQLOCK, change all SETIPL #0
0000     83 ;               to SETIPL #IPL$_ASTDEL, and fix two broken word displacements.
0000     84 ;
0000     85 ;       V03-018 LJK0264         Lawrence J. Kenzh               29-Feb-1984
0000     86 ;               Fix broken word displacements.
0000     87 ;
0000     88 ;       V03-017 SRB0108         Steve Beckhardt                 11-Jan-1983
0000     89 ;               Added support for hashed root directory.
0000     90 ;
0000     91 ;       V03-016 SRB0106         Steve Beckhardt                 6-Dec-1983
0000     92 ;               Changed LKB$L_REFCNT, RSB$L_REFCNT, RSB$L_BLKASTCNT
0000     93 ;               to word fields.
0000     94 ;
0000     95 ;       V03-015 SRB0101         Steve Beckhardt                 7-Sep-1983
0000     96 ;               Fixed bug that prevented canceling locks with sublocks.
0000     97 ;
0000     98 ;       V03-014 SRB0100         Steve Beckhardt                 18-Jul-1983
0000     99 ;               Enabled local deadlock detection.  Fixed PMS counters.
0000    100 ;               Fixed code for canceling locks and use of routine FREE_LKB.
0000    101 ;
0000    102 ;       V03-013 SRB0094         Steve Beckhardt                 23-Jun-1983
0000    103 ;               Added support for PROTECT and RECOVER bits.  Added support
0000    104 ;               for converting new locks to be system owned.  Made several
0000    105 ;               changes to support multinode failover.
0000    106 ;
0000    107 ;       V03-012 SRB0090         Steve Beckhardt                 20-May-1983
0000    108 ;               Added support for extending lock id. table.  Moved some
0000    109 ;               PMS counters and added new ones.  Cleared CVTSYS bit instead
0000    110 ;               of ignoring it to fix bug involving system owned locks.
0000    111 ;               Added support for stalling requests during a failover.
0000    112 ;
0000    113 ;       V03-011 SRB0083         Steve Beckhardt                 29-Apr-1983
0000    114 ;               Added support for system owned locks.  Rewrote portions
```

```
0000   115 ;                of the conversion and dequeue code.
0000   116 ;
0000   117 ;        V03-010 SRB0073         Steve Beckhardt                 25-Mar-1983
0000   118 ;                Added support for two new $DEQ flags:  CANCEL and INVVALBLK.
0000   119 ;
0000   120 ;        V03-009 SRB0069         Steve Beckhardt                 7-Mar-1983
0000   121 ;                Changed HALT to BUG_CHECK.  Modified handling of value blocks
0000   122 ;                on conversions to return value block on conversions to same
0000   123 ;                lock mode.  Changed access mode handling to deliver ASTs in
0000   124 ;                mode of caller.  Added support for LCK$M_NOQUOTA flag.
0000   125 ;                Added conditionals around .PSECTS to allow loading for
0000   126 ;                debugging.
0000   127 ;
0000   128 ;        V03-008 RNG0008         Rod N. Gamache                  2-Feb-1983
0000   129 ;                Changed paged PSECT to Y$EXEPAGED PSECT.
0000   130 ;
0000   131 ;        V03-007 SRB0061         Steve Beckhardt                 7-Jan-1983
0000   132 ;                Added support for distributed lock conversions.
0000   133 ;
0000   134 ;        V03-006 SRB0057         Steve Beckhardt                 15-Dec-1982
0000   135 ;                Added support for distributed $ENQ of new locks,
0000   136 ;                distributed $DEQ, blocking ASTs, root directory
0000   137 ;                handling, etc.
0000   138 ;
0000   139 ;        V03-005 SRB0055         Steve Beckhardt                 6-Oct-1982
0000   140 ;                Fixed a number of small things that prevented service from
0000   141 ;                being loadable.  Added coded to dequeue subtrees.
0000   142 ;
0000   143 ;        V03-004 SRB0053         Steve Beckhardt                 6-Oct-1982
0000   144 ;                Fixed bug causing improper handling of common event flags
0000   145 ;                on conversions.
0000   146 ;
0000   147 ;        V03-003 KDM0002         Kathleen D. Morse       28-Jun-1982
0000   148 ;                Added $PRDEF and $SSDEF.
0000   149 ;--
```

```
                     0000   151          .SBTTL  DECLARATIONS
                     0000   152 ;
                     0000   153 ; INCLUDE FILES:
                     0000   154 ;
                     0000   155
                     0000   156 ;
                     0000   157 ; EXTERNAL SYMBOLS:
                     0000   158 ;
                     0000   159
                     0000   160 ;
                     0000   161 ; MACROS:
                     0000   162 ;
                     0000   163          $ACBDEF                         ; ACB offsets
                     0000   164          $CADEF                          ; Conditional assembly switches
                     0000   165          $DYNDEF                         ; Structure type code definitions
                     0000   166          $IPLDEF                         ; IPL definitions
                     0000   167          $IRPDEF                         ; IRP offsets
                     0000   168          $JIBDEF                         ; JIB offsets
                     0000   169          $LCKDEF                         ; LCK definitions
                     0000   170          $LKBDEF                         ; LKB offsets
                     0000   171          $PCBDEF                         ; PCB offsets
                     0000   172          $PRDEF                          ; Processor register definitions
                     0000   173          $PRIDEF                         ; Priority increment class definitions
                     0000   174          $PRVDEF                         ; Privilege bits
                     0000   175          $PSLDEF                         ; PSL definitions
                     0000   176          $RSBDEF                         ; RSB offsets
                     0000   177          $RSNDEF                         ; Resource numbers
                     0000   178          $SSDEF                          ; System status code definitions
                     0000   179 ;
                     0000   180 ; EQUATED SYMBOLS:
                     0000   181 ;
                     0000   182
                     0000   183 ;
                     0000   184 ; Enqueue system service argument list offsets:
                     0000   185 ;
                     0000   186
00000004             0000   187 EFN = 4                                 ; Event flag number
00000008             0000   188 LKMODE = 8                              ; Lock mode
0000000C             0000   189 LKSB = 12                               ; Lock status block address
00000010             0000   190 FLAGS = 16                              ; Flags
00000014             0000   191 RESNAM = 20                             ; Resource name
00000018             0000   192 PARID = 24                              ; Parent id
0000001C             0000   193 ASTADR = 28                             ; AST routine address
00000020             0000   194 ASTPRM = 32                             ; AST routine parameter
00000024             0000   195 BLKAST = 36                             ; Blocking AST address
00000028             0000   196 ACMODE = 40                             ; Access mode
0000002C             0000   197 PROT = 44                               ; Protection mask
                     0000   198
                     0000   199 ;
                     0000   200 ; Dequeue system service argument list offsets
                     0000   201 ;
                     0000   202
00000004             0000   203 LOCKID = 4                              ; Lock id
00000008             0000   204 VALBLK = 8                              ; Value block address
0000000C             0000   205 DEQ_ACMODE = 12                         ; Access mode
00000010             0000   206 DEQ_FLAGS = 16                          ; Flags
                     0000   207
```

```
0000000F  0000    208 POOL_MASK = ^XF                         ; Pool allocation granularity mask
          0000    209
          0000    210 ;
          0000    211 ; OWN STORAGE:
          0000    212 ;
          0000    213
          0000    214         .IF NDF LOADSW
00000000  0000    215         .PSECT  LOCKMGR,LONG
          0000    216         .IFF
          0000    217         .PSECT  $$$020
          0000    218         .ENDC
```

```
                                                N 14
0000    220 ;
0000    221 ;                       LOCK MODE COMPATIBILITY TABLE
0000    222 ;
0000    223 ;
0000    224 ; The lock mode compatibility table represents the following
0000    225 ; compatibility matrix.
0000    226 ;
0000    227 ;
0000    228 ;                  |  NL   |  CR   |  CW   |  PR   |  PW   |  EX
0000    229 ;                  | NL/SW | R/SW  | W/SW  | R/SR  | W/SR  | W/NL
0000    230 ;            ------+-------+-------+-------+-------+-------+-------
0000    231 ;            NL NL/SW | yes | yes | yes | yes | yes | yes
0000    232 ;            ------+-------+-------+-------+-------+-------+-------
0000    233 ;            CR  R/SW | yes | yes | yes | yes | yes |  no
0000    234 ;            ------+-------+-------+-------+-------+-------+-------
0000    235 ;            CW  W/SW | yes | yes | yes |  no |  no |  no
0000    236 ;            ------+-------+-------+-------+-------+-------+-------
0000    237 ;            PR  R/SR | yes | yes |  no | yes |  no |  no
0000    238 ;            ------+-------+-------+-------+-------+-------+-------
0000    239 ;            PW  W/SR | yes | yes |  no |  no |  no |  no
0000    240 ;            ------+-------+-------+-------+-------+-------+-------
0000    241 ;            EX  W/NL | yes |  no |  no |  no |  no |  no
0000    242 ;
0000    243 ; The compatibility table makes the following assumptions regarding
0000    244 ; the values of the lock modes.  These values cannot be changed without
0000    245 ; changing the table
0000    246
0000    247         ASSUME  LCK$K_NLMODE  EQ  0
0000    248         ASSUME  LCK$K_CRMODE  EQ  1
0000    249         ASSUME  LCK$K_CWMODE  EQ  2
0000    250         ASSUME  LCK$K_PRMODE  EQ  3
0000    251         ASSUME  LCK$K_PWMODE  EQ  4
0000    252         ASSUME  LCK$K_EXMODE  EQ  5
0000    253
0000    254 LCK$COMPAT_TBL::
3F  0000    255         .BYTE   ^B 111111
1F  0001    256         .BYTE   ^B 011111
07  0002    257         .BYTE   ^B 000111
0B  0003    258         .BYTE   ^B 001011
03  0004    259         .BYTE   ^B 000011
01  0005    260         .BYTE   ^B 000001
```

```
                ;
                ;                       SYNCHRONOUS CONVERSION TABLE
                ;
                ; This table indicates which conversions are always synchronous as
                ; oppposed to those which may be asynchronous.
                ;
                ;                                       TO
                ;
                ;                    |  NL   |  CR   |  CW   |  PR   |  PW   |  EX
                ;                    | NL/SW | R/SW  | W/SW  | R/SR  | W/SR  | W/NL
                ;           ---------+-------+-------+-------+-------+-------+-------
                ;           NL NL/SW | yes   | no    | no    | no    | no    | no
                ;           ---------+-------+-------+-------+-------+-------+-------
                ;           CR  R/SW | yes   | yes   | no    | no    | no    | no
                ;           ---------+-------+-------+-------+-------+-------+-------
                ;           CW  W/SW | yes   | yes   | yes   | no    | no    | no
                ; FROM      ---------+-------+-------+-------+-------+-------+-------
                ;           PR  R/SR | yes   | yes   | no    | yes   | no    | no
                ;           ---------+-------+-------+-------+-------+-------+-------
                ;           PW  W/SR | yes   | yes   | yes   | yes   | yes   | no
                ;           ---------+-------+-------+-------+-------+-------+-------
                ;           EX  W/NL | yes   | yes   | yes   | yes   | yes   | yes
                ;
                LCK$SYNCCVT_TBL::
01              .BYTE   ^B 000001
03              .BYTE   ^B 000011
07              .BYTE   ^B 000111
0B              .BYTE   ^B 001011
1F              .BYTE   ^B 011111
3F              .BYTE   ^B 111111
```

```
                        .SBTTL  EXESENQ - Enqueue system service

                ;++
                ; FUNCTIONAL DESCRIPTION:
                ;
                ;       This routine handles the $ENQ system service.
                ;
                ; CALLING SEQUENCE:
                ;
                ;       CALLS/G EXESENQ (actually called through the system service
                ;       dispatcher)
                ;
                ; INPUT PARAMETERS:
                ;
                ;       EFN(AP)         Event flag number
                ;       LKMODE(AP)      Lock mode
                ;       LKSB(AP)        Address of lock status block
                ;       FLAGS(AP)       Flags
                ;       RESNAM(AP)      Address of descriptor of resource name
                ;       PARID(AP)       Parent lock id
                ;       ASTADR(AP)      Address of completion AST routine
                ;       ASTPRM(AP)      AST parameter
                ;       BLKAST(AP)      Address of blocking AST routine
                ;       PROT(AP)        Protection mask
                ;       ACMODE(AP)      Access mode
                ;
                ;       R4              Address of PCB
                ;
                ; OUTPUT PARAMETERS:
                ;
                ;       R0              Completion code
                ;
                ; COMPLETION CODES:
                ;
                ;   In R0:
                ;
                ;       SS$_NORMAL              Successful completion
                ;       SS$_SYNCH               Synchronous successful completion
                ;       SS$_ACCVIO              Access violation (on LKSB or resource name)
                ;       SS$_BADPARAM            Bad lock mode
                ;       SS$_IVLOCKID            Invalid lock id
                ;       SS$_CVTUNGRANT          Attempted to convert an ungranted lock
                ;       SS$_PARNOTGRANT         Parent lock not granted
                ;       SS$_NOSYSLCK            No SYSLCK privilege (needed for a system lock)
                ;       SS$_IVBUFLEN            Resource name length = 0 or > 31
                ;       SS$_INSFMEM             Insufficient dynamic memory
                ;       SS$_EXASTLM             Exceeded AST quota
                ;       SS$_EXENQLM             Exceeded enqueue quota
                ;       SS$_NOTQUEUED           Request was not queued
                ;       SS$_EXDEPTH             Exceeded allowed depth of resource name tree
                ;       SS$_NOPRIV              No privilege (to not charge quota or convert to
                ;                               system owned lock)
                ;       SS$_SUBLOCKS            Attempted to convert a system owned lock with
                ;                               sublocks
                ;       SS$_PARNOTSYS           Parent lock not system owned
                ;
                ;   In LKSB:
```

```
                                                D 15
                     000C   350 ;
                     000C   351 ;       SS$_NORMAL                  Successful completion
                     000C   352 ;       SS$_DEADLOCK                Deadlock detected
                     000C   353 ;       SS$_ABORT                   Lock was dequeued before being granted
                     000C   354 ;       SS$_CANCEL                  Lock request was canceled before being granted
                     000C   355 ;
                     000C   356 ;--
                     000C   357
                     000C   358         .IF NDF LOADSW
                00000000    359         .PSECT  Y$EXEPAGED
                     0000   360         .ENDC
                     0000   361
                     0000   362         .ENABL  LSB
                     0000   363
00000000'GF    16    0000   364 5$:     JSB     G^SCH$GETEFC                ; Validate common event flag
   53    04 AC    D0  0006   365         MOVL    EFN(AP),R3                  ; Refetch event flag number
         0C 50    E8  000A   366         BLBS    R0,10$                      ; Rejoin common code
                   04  000D   367         RET                                 ; Return - bad event flag
                     000E   368
                     000E   369         .IF NDF LOADSW
                0FFC 000E   370         .ENTRY  EXE$ENQ,^M<R2,R3,R4,R5,R6,R7,R8,R9,R10,R11>
                     0010   371         .IFF
                     0010   372         .ENTRY  EXE$$ENQ,^M<R2,R3,R4,R5,R6,R7,R8,R9,R10,R11>
                     0010   373         .ENDC
                     0010   374
                     0010   375         ; Verify event flag is ok
                     0010   376
   53    04 AC    D0  0010   377         MOVL    EFN(AP),R3                  ; Get event flag number
      3F    53    91  0014   378         CMPB    R3,#63                      ; Is it a local event flag?
            E7    1A  0017   379         BGTRU   5$                          ; No - validate common event flag
                     0019   380
                     0019   381 10$:     ; Probe lock status block.  For performance reasons, we assume the
                     0019   382         ; presence of a value block and probe 24 bytes.  If this fails,
                     0019   383         ; then we check to see if there isn't a value block and in
                     0019   384         ; that case probe 8 bytes.
                     0019   385
                     0019   386         ASSUME  FLAGS  EQ  LKSB+4
                     0019   387         ASSUME  LCK$V_VALBLK  EQ  0
                     0019   388
   58    0C AC    7D  0019   389         MOVQ    LKSB(AP),R8                 ; Get address of lock status block in
                     001D   390                                             ; R8 and get flags in R9
                     001D   391         IFWRT   #24,(R8),20$                ; Branch if writable
         1A 59    E8  0023   392         BLBS    R9,60$                      ; Error if there's a value block
                     0026   393         IFNOWRT #8,(R8),60$                 ; No value block - br. if not writable
                     002C   394
                     002C   395 20$:     ; Get lock mode and check for legality
                     002C   396
   57    08 AC    9A  002C   397         MOVZBL  LKMODE(AP),R7               ; Get lock mode
      05    57    91  0030   398         CMPB    R7,#LCK$K_EXMODE            ; Is it legal?
            0E    1A  0033   399         BGTRU   70$                         ; No - error
                     0035   400
                     0035   401         ; Determine if this is a new lock request or a conversion
                     0035   402
      59    02    B3  0035   403         BITW    #LCK$M_CONVERT,R9           ; Is convert bit set?
                     0038   404
                     0038   405         .IF NDF LOADSW
                  22 13  0038   406         BEQL    NEW_LOCK                    ; Branch if new lock
```

```
00000049'GF   17  003A   407          JMP     G^CONVERSION                    ; Conversion
                  0040   408          .IFF
                  0040   409          BNEQ    CONVERSION                      ; Branch if conversion
                  0040   410          BRW     NEW_LOCK                        ; New lock
                  0040   411          .ENDC
                  0040   412
                  0040   413 ;
                  0040   414 ; ERRORS:
                  0040   415 ;
                  0040   416
        0009      31  0040   417 60$:    BRW     ACCVIO                          ; Couldn't access LKSB
                  0043   418
     50   14      3C  0043   419 70$:    MOVZWL  S^#SS$_BADPARAM,R0              ; Bad lock mode
00000543'EF       17  0046   420          JMP     ERROR_EXIT_R0
                  004C   421
                  004C   422          .DSABL  LSB
```

```
                        .SBTTL  CONVERSIONS

;++
; FUNCTIONAL DESCRIPTION:
;
;       This routine handles lock mode conversions.
;
; CALLING SEQUENCE:
;
;       Branched to from $ENQ service
;       RET back to caller
;
; INPUTS:
;
;       R3      Event flag number
;       R4      Address of PCB
;       R7      Lock mode
;       R8      Address of LKSB
;       R9      Flags
;
;       Caller's argument list (offsets from AP)
;
; OUTPUTS:
;
;       R0      Completion code
;
; IMPLICIT OUTPUTS:
;
;       Caller's lock status block gets final request status (perhaps
;       aynchronously)
;
; COMPLETION CODES:
;
;   In R0:
;
;       SS$_NORMAL              Successful completion
;       SS$_SYNCH               Synchronous successful completion
;       SS$_IVLOCKID            Invalid lock id
;       SS$_CVTUNGRANT          Attempted to convert an ungranted lock
;       SS$_INSFMEM             Insufficient dynamic memory
;       SS$_EXASTLM             Exceeded AST quota
;       SS$_NOTQUEUED           Request was not queued
;       SS$_NOPRIV              No privilege (to convert to system owned lock)
;       SS$_SUBLOCKS            Attempted to convert a system owned lock with
;                               sublocks
;       SS$_PARNOTSYS           Parent lock not system owned
;
;   In LKSB:
;
;       SS$_NORMAL              Successful completion
;       SS$_DEADLOCK            Deadlock detected
;       SS$_ABORT               Lock was dequeued before being granted
;       SS$_CANCEL              Lock request was canceled before being granted
;--

        .IF NDF LOADSW
        .PSECT  LOCKMGR
```

```
                     000C   481          .ENDC
                     000C   482
                     000C   483          .ENABL  LSB
                     000C   484
                     000C   485 ;
                     000C   486 ; Errors:
                     000C   487 ;
                     000C   488
 50   0E32 8F   3C   000C   489 8$:       MOVZWL  #SS$_RETRY,R0           ; Retry operation
           05   11   0011   490           BRB     12$
 50   213C 8F   3C   0013   491 10$:      MOVZWL  #SS$_CVTUNGRANT,R0      ; Lock not currently granted
        0528   31   0018   492 12$:      BRW     ERROR_EXIT_R0
                     001B   493
   10 57   00   E0   001B   494 14$:      BBS     #LKB$V_DCPLAST,R7,16$   ; Branch if queued for completion AST
           55   DD   001F   495           PUSHL   R5                      ; Save lock mode
      55   56   D0   0021   496           MOVL    R6,R5                   ; Queued for blocking AST only
00000000'GF   16   0024   497           JSB     G^$CH$REMOVACB          ; Remove it
           55 8ED0   002A   498           POPL    R5                      ; Restore lock mode
           53   11   002D   499           BRB     21$                     ; Continue with conversion
                     002F   500 16$:      SETIPL  #IPL$_ASTDEL            ; Lower IPL
00000251'EF   16   0032   501           JSB     FREE_LKB                ; Free up LKB
           25   11   0038   502           BRB     15$                     ; Returns at IPL$_SYNCH
                     003A   503
                     003A   504 17$:      ; Stalling some requests - see which ones
                     003A   505
           0A   19   003A   506           BLSS    18$                     ; Stalling all requests
           09   E1   003C   507           BBC     #LKB$V_PROTECT,-        ; Stalling only protected locks
      33 2A A6        003E   508                   LKB$W_STATUS(R6),19$    ; Branch if this is not a protected lock
           1A   E0   0041   509           BBS     #PCB$V_RECOVER,-        ; Don't stall recovery process,
   C6 24 A4        0043   510                   PCB$L_STS(R4),8$        ; return error instead
        0C47   31   0046   511 18$:      BRW     STALL_REQ               ; Stall this request
                     0049   512
                     0049   513 CONVERSION:
                     0049   514          ; First get input arguments into registers (and on stack) because
                     0049   515          ; when they're stored we'll be at IPL$_SYNCH.
                     0049   516
                     0049   517          ASSUME  ASTPRM  EQ  ASTADR+4
                     0049   518          ASSUME  LCK$V_VALBLK  EQ  0
                     0049   519
      55   57   D0   0049   520          MOVL    R7,R5                   ; Move lock mode to R5
5A    1C AC   7D   004C   521          MOVQ    ASTADR(AP),R10          ; Fetch completion AST address (R10)
                     0050   522                                          ; and AST parameter (R11)
52    24 AC   D0   0050   523          MOVL    BLKAST(AP),R2           ; Fetch blocking AST address (R2)
      08 59   E9   0054   524          BLBC    R9,15$                  ; Branch if no value block
7E    10 A8   7D   0057   525          MOVQ    16(R8),-(SP)            ; Copy caller's value block onto stack
7E    08 A8   7D   005B   526          MOVQ    8(R8),-(SP)
                     005F   527
                     005F   528 15$:      ; Get lock id, validate and convert to LKB address in R6.
                     005F   529          ; Note that our raising IPL to IPL$_SYNCH is tied to the assumptions
                     005F   530          ; stated in the routine FREE_LKB.
                     005F   531
51    04 A8   D0   005F   532          MOVL    4(R8),R1                ; Fetch lock id
                     0063   533          SETIPL  #IPL$_SYNCH             ; Raise IPL
        08FF   30   0066   534          BSBW    VERIFYLOCKID            ; Verify lock id and return LKB in R6,
                     0069   535                                          ; caller's access mode in R1
      AC 50   E9   0069   536          BLBC    R0,12$                  ; Error
                     006C   537
```

```
                                006C    538          ; Verify that we aren't stalling lock requests.
                                006C    539
                00000000'GF     95      006C    540          TSTB    G^LCK$GB_STALLREQS      ; Are we stalling requests?
                                C6      12      0072    541          BNEQ    17$                     ; Yes, see which ones
                                                0074    542
                                                0074    543 19$:     ; Verify lock is granted and that the LKB is not queued to deliver
                                                0074    544          ; an AST.  If ok, store input args in LKB.
                                                0074    545
                                                0074    546          ASSUME  LKB$W_STATUS  EQ  LKB$W_FLAGS+2
                                                0074    547          ASSUME  LKB$K_GRANTED  GT  0
                                                0074    548          ASSUME  LKB$L_BLKASTADR  EQ  LKB$L_CPLASTADR+4
                                                0074    549
                                        36 A6   95      0074    550          TSTB    LKB$B_STATE(R6)         ; Is the lock currently granted?
                                        9A      15      0077    551          BLEQ    10$                     ; No - error
                                57   2A A6     3C      0079    552          MOVZWL  LKB$W_STATUS(R6),R7     ; Pick up current status
                                    57  03      B3      007D    553          BITW    #LKB$M_DCPLAST-         ; Is the ACB portion of the LKB in use?
                                                0080    554                  !LKB$M_DBLKAST,R7       ; (are we delivering a completion or
                                        99      12      0080    555          BNEQ    14$                     ; blocking AST?).  Branch if yes.
                                                AA      0082    556 21$:     BICW    #LKB$M_DCPLAST-         ; Clear relevant status bits
                                                0083    557                  !LKB$M_DBLKAST-         ; The following bits retain their
                                                0083    558                  !LKB$M_ASYNC-           ; old state:
                                                0083    559                  !LKB$M_BLKASTQED-       ;       MSTCPY (shouldn't be set)
                                                0083    560                  !LKB$M_TIMOUTQ-         ;       NOQUOTA
                                                0083    561                  !LKB$M_WASSYSOWN-       ;       PROTECT
                                                0083    562                  !LKB$M_CVTTOSYS,-
                        2A A6   01CF    8F      0083    563                  LKB$W_STATUS(R6)
                            37 A6       53  90  0088    564          MOVB    R3,LKB$B_EFN(R6)        ; Store event flag number
                            24 A6       58  D0  008C    565          MOVL    R8,LKB$L_LKSB(R6)       ; Store LKSB address
                            58   50 A6       D0  0090    566          MOVL    LKB$L_RSB(R6),R8        ; Get RSB address in R8
                                                0094    567
                                                0094    568          ; Determine if we need to convert this lock to system owned or
                                                0094    569          ; process owned.  R1 contains caller's acccess mode.
                                                0094    570
                                53      35 A6   9A      0094    571          MOVZBL  LKB$B_GRMODE(R6),R3     ; Save old granted mode
                                        0C A6   D5      0098    572          TSTL    LKB$L_PID(R6)           ; Is lock currently system owned?
                                            13  13      009B    573          BEQL    22$                     ; Yes
                                    21  59      06      E1      009D    574          BBC     #LCK$V_CVTSYS,R9,25$    ; No, handle normally if CVTSYS is clear
                        16 FF5F CF43        55      E1      00A1    575          BBC     R5,LCK$SYNCCVT_TBL[R3],24$ ; Clear CVTSYS flag if async. cvt.
                                    0120    30      00A8    576          BSBW    CVT_TO_SYS              ; Convert to system owned lock
                                59      08      A8      00AB    577 26$:     BISW    #LCK$M_SYNCSTS,R9       ; CVTSYS implies SYNCSTS so set it
                                        12      11      00AE    578          BRB     25$
                        04 FF50 CF43        55      E1      00B0    579 22$:     BBC     R5,LCK$SYNCCVT_TBL[R3],23$ ; Cvt to process owned if async. cvt
                                    F0  59      06      E0      00B7    580          BBS     #LCK$V_CVTSYS,R9,26$    ; Leave as is if CVTSYS flag is set
                                        014A    30      00BB    581 23$:     BSBW    CVT_TO_PRC              ; Convert to process owned lock
                                    00  59      06      E4      00BE    582 24$:     BBSC    #LCK$V_CVTSYS,R9,25$    ; Clear CVTSYS flag, ignore branch
                                                00C2    583
                                                00C2    584 25$:     ; All error checking and conversion between system owned and process
                                                00C2    585          ; owned has been performed.  Store new AST addresses and parameter.
                                                00C2    586
                                    20 A6       D0      00C2    587          MOVL    LKB$L_BLKASTADR(R6),-   ; Save old blocking AST address
                                    5C A6               00C5    588                  LKB$L_OLDBLKAST(R6)
                                                00C7    589                                          ; Note:  This tests the old contents
                                                00C7    590                                          ; of this field and must come before
                                                00C7    591                                          ; the new contents are stored.
                                        08      13      00C7    592          BEQL    30$                     ; No
                                    14 A6       D0      00C9    593          MOVL    LKB$L_ASTPRM(R6),-      ; Save old AST parameter
                                    58 A6               00CC    594                  LKB$L_OLDASTPRM(R6)
```

```
                42 A8    B7  00CE   595          DECW    RSB$W_BLKASTCNT(R8)     ; Decr. blocking AST count
             14 A6       5B  00D1   596 30$:     MOVL    R11,LKB$L_ASTPRM(R6)    ; Store new AST parameter
                5B       52  00D5   597          MOVL    R2,R11                  ; Move blocking AST address
             1C A6       5A  7D  00D8   598          MOVQ    R10,LKB$L_CPLASTADR(R6) ; Store new completion AST address (R10)
                                 00DC   599                                          ; and new blocking AST address (R11)
             28 A6       59  B0  00DC   600          MOVW    R9,LKB$W_FLAGS(R6)      ; Store flags
                51       55  D0  00E0   601          MOVL    R5,R1                   ; Move requested lock mode
                5B       53  D0  00E3   602          MOVL    R3,R11                  ; Move granted lock mode
                                 00E6   603
                                 00E6   604          ; If a value block is specified and we are converted down (or same)
                                 00E6   605          ; from PW or EX, then store caller's value block in RSB.
                                 00E6   606
                   1A 59         E9  00E6   607          BLBC    R9,33$                  ; Branch if no value block specified
                   04 5B         91  00E9   608          CMPB    R11,#LCK$K_PWMODE       ; Is granted mode PW or higher?
                      15         1F  00EC   609          BLSSU   33$                     ; No
                   5B 51         91  00EE   610          CMPB    R1,R11                  ; Is conversion to a higher lock mode?
                      10         1A  00F1   611          BGTRU   33$                     ; Yes
                28 A8    6E       7D  00F3   612          MOVQ    (SP),RSB$Q_VALBLK(R8)   ; No, copy caller's value block to RSB
             30 A8    08 AE       7D  00F7   613          MOVQ    8(SP),RSB$Q_VALBLK+8(R8)
                   3C A8    D6       00FC   614          INCL    RSB$L_VALSEQNUM(R8)     ; Increment value block sequence number
                      02    AA       00FF   615          BICW    #RSB$M_VALINVLD,-       ; Validate value block
                   0E A8               0101   616                  RSB$W_STATUS(R8)
                                       0103   617
                                       0103   618 33$:     ; If this is a process copy LKB then jump to distributed lock
                                       0103   619          ; code.
                                       0103   620
             53    38 A8    D0  0103   621          MOVL    RSB$L_CSID(R8),R3       ; Get CSID of destination system
                      28    12  0107   622          BNEQ    35$                     ; Yes
                                       0109   623
                         00000002      0109   624          .IF NE  CA$_MEASURE
          00000000'GF       D6  0109   625          INCL    G^PMS$GL_ENQCVT_LOC
                                       010F   626          .ENDC
                                       010F   627
                                       010F   628 LCK$LOCAL_CVT::
                                       010F   629          ; Remove this lock from the granted queue.  If it was the only one and
                                       010F   630          ; if the conversion queue is also empty, then the conversion request
                                       010F   631          ; can be granted immediately.  This path is special cased because it
                                       010F   632          ; is the normal case.
                                       010F   633
             50    38 A6    0F  010F   634          REMQUE  LKB$L_SQFL(R6),R0       ; Remove lock from granted queue
                      22    12  0113   635          BNEQ    40$                     ; Not the only one
             5A    18 A8    DE  0115   636          MOVAL   RSB$L_CVTQFL(R8),R10    ; It's the only granted lock
                5A    6A    D1  0119   637          CMPL    (R10),R10               ; Is conversion queue empty?
                      19    12  011C   638          BNEQ    40$                     ; It's not - must check the longer way
                   04EF     30  011E   639          BSBW    LCK$GRANT_LOCK_ALT      ; It is - grant lock
                5A    08    C0  0121   640          ADDL    #8,R10                  ; Point to wait queue
                5A    6A    D1  0124   641          CMPL    (R10),R10               ; Is wait queue empty?
                      42    13  0127   642          BEQL    60$                     ; Yes, exit with completion status in R0
                5A    50    D0  0129   643          MOVL    R0,R10                  ; No, save status in R10
                   07EC     30  012C   644          BSBW    LCK$GRANTWTRS           ; Try granting waiting locks
                      37    11  012F   645          BRB     50$                     ; Exit with completion status in R10
                                       0131   646
          00000000'GF       17  0131   647 35$:     JMP     G^LCK$SND_CVTREQ        ; Send convert request
                                       0137   648
                                       0137   649          ; Possible return points are:
                                       0137   650          ;
                                       0137   651          ;       LCK$CVT_GRANTED         Conversion was granted
```

```
                        0137   652          ;       LCK$QUEUE_EXIT          Conversion was queued
                        0137   653          ;       LCK$CVTNOTQED           Conversion was not queued
                        0137   654          ;       LCK$LOCAL_CVT           Remote system failed and conversion
                        0137   655          ;                               should now be done locally
                        0137   656
                        0137   657 40$:     ; There was at least one other holder of the resource so we have
                        0137   658          ; to check for compatibility the longer way.  The granted mode
                        0137   659          ; of this lock is compared with the conversion grant mode.  If,
                        0137   660          ; other than the head of the conversion queue, there are granted
                        0137   661          ; locks with higher lock modes than this lock, then there
                        0137   662          ; is no need to recompute the group grant mode or attempt to
                        0137   663          ; grant waiting conversions.
                        0137   664
          OD A8   5B 91 0137   665          CMPB    R11,RSB$B_CGMODE(R8)    ; Is granted mode = conv. grant mode?
                  10 13 013B   666          BEQL    45$                     ; Yes
       55    OC A8   9A 013D   667          MOVZBL  RSB$B_GGMODE(R8),R5     ; No, get group grant mode
39 FEB9 CF45    51   E1 0141   668          BBC     R1,LCK$COMPAT_TBL[R5],80$ ; Branch if not compatible
              04C0   30 0148   669          BSBW    LCK$GRANT_LOCK          ; Grant the lock
                1E   11 014B   670          BRB     60$                     ; Exit with completion status in R0
                     014D   671
              075F   30 014D   672 45$:     BSBW    LCK$COMP_GGMODE         ; Compute new group grant mode in R5
2A FEAA CF45    51   E1 0150   673          BBC     R1,LCK$COMPAT_TBL[R5],80$ ; Branch if not compatible
          OC A8   55   90 0157   674          MOVB    R5,RSB$B_GGMODE(R8)     ; Store group grant mode in RSB
          OD A8   55   90 015B   675          MOVB    R5,RSB$B_CGMODE(R8)     ; Also store conversion grant mode
              04A9   30 015F   676          BSBW    LCK$GRANT_LOCK          ; Grant lock
             5A   50   D0 0162   677          MOVL    R0,R10                  ; Save completion status in R10
              076A   30 0165   678          BSBW    LCK$GRANTCVTS           ; Try granting conversions and waiters
             50   5A   D0 0168   679 50$:     MOVL    R10,R0                  ; Restore completion status to R0
                     016B   680
                     016B   681 60$:     ; The conversion was performed synchronously.  Completion
                     016B   682          ; status is in R0.  If a value block is specified then
                     016B   683          ; if we converted up or to the same level at NL - PR then
                     016B   684          ; return value block to caller.
                     016B   685
                     016B   686          ASSUME  LCK$V_VALBLK  EQ  0
                     016B   687
                     016B   688 LCK$CVT_GRANTED::
          10 59   E9 016B   689          BLBC    R9,75$                  ; Branch if no value block specified
       5B   35 A6   91 016E   690          CMPB    LKB$B_GRMODE(R6),R11    ; Was conversion to a lower lock mode?
              0A   1F 0172   691          BLSSU   75$                     ; Yes, don't return value block
              05   1A 0174   692          BGTRU   65$                     ; Cvted to a higher mode; return valblk
          04   5B   91 0176   693          CMPB    R11,#LCK$K_PWMODE       ; Was old mode PW or higher?
              03   1E 0179   694          BGEQU   75$                     ; Yes, don't return value block
            035A   31 017B   695 65$:     BRW     LCK$RET_VALBLK          ; No, return value block to caller
            037A   31 017E   696 75$:     BRW     LCK$NORET_VALBLK
                     0181   697
                     0181   698 80$:     ; The conversion cannot be granted.  Queue the request
                     0181   699          ; unless the noqueue bit is set.  If the conversion queue is empty
                     0181   700          ; then R5 contains the new conversion grant mode.
                     0181   701
          0A 59   02   E0 0181   702          BBS     #LCK$V_NOQUEUE,R9,85$   ; Branch if noqueue is set
                     0185   703
                     0185   704          ; Queue the conversion
                     0185   705
          34 A6   51   90 0185   706          MOVB    R1,LKB$B_RQMODE(R6)     ; Store requested mode
              0622   30 0189   707          BSBW    LCK$QUEUECVT            ; Insert onto conversion queue, etc.
              0369   31 018C   708          BRW     LCK$QUEUED_EXIT
```

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                                                K 15
                     018F    709
                     018F    710 85$:    ; The request is not to be queued.  Insert back onto the
                     018F    711         ; granted queue.  R7 contains old LKB$W_STATUS.
                     018F    712
           38 A6  0E 018F    713         INSQUE  LKB$L_SQFL(R6),-        ; Put lock back on granted queue
           10 A8     0192    714                 RSB$L_GRQFL(R8)
                     0194    715 LCK$CVTNOTQED::
                     0194    716         ; Restore old blocking AST address and parameter and requeue
                     0194    717         ; a blocking AST, if necessary.
                     0194    718
           00000002  0194    719         .IF NE  CA$_MEASURE
00000000'GF    D6    0194    720         INCL    G^PMS$GL_ENQNOTQD
                     019A    721         .ENDC
                     019A    722
           5C A6     D0 019A    723         MOVL    LKB$L_OLDBLKAST(R6),-   ; Restore old blocking AST address
           20 A6        019D    724                 LKB$L_BLKASTADR(R6)
              14     13 C19F    725         BEQL    95$                     ; None specified
           58 A6     D0 01A1    726         MOVL    LKB$L_OLDASTPRM(R6),-   ; Restore old AST parameter
           14 A6        01A4    727                 LKB$L_ASTPRM(R6)
           42 A8     B6 01A6    728         INCW    RSB$W_BLKASTCNT(R8)     ; Incr. blocking AST count
     08 57    01     E1 01A9    729         BBC     #LKB$V_DBLKAST,R7,95$   ; Branch if blocking AST wasn't queued
        55    56     D0 01AD    730         MOVL    R6,R5
           06CA     30 01B0    731         BSBW    QUEUE_BLKAST            ; Requeue blocking AST
              0E    11 01B3    732         BRB     98$                     ; Couldn't be system owned if a blocking
                     01B5    733                                         ; AST was queued.
                     01B5    734
                     01B5    735 95$:    ; Now convert lock back to system owned, if necessary
                     01B5    736
              07     E1 01B5    737         BBC     #LKB$V_WASSYSOWN,-      ; Branch if it wasn't system owned
           09 2A A6        01B7    738                 LKB$W_STATUS(R6),98$
     54 00000000'GF    D0 01BA    739         MOVL    G^SCH$GL_CURPCB,R4      ; Get PCB address
              18     10 01C1    740         BSBB    CVT_TO_SYS_INT          ; Convert to system lock
                     01C3    741
                     01C3    742 98$:    ; Complete request with error status
                     01C3    743
        50 09B8 8F    3C 01C3    744         MOVZWL  #SS$_NOTQUEUED,R0       ; Store status
              0378    31 01C8    745         BRW     ERROR_EXIT_R0           ; Exit
                     01CB    746
                     01CB    747         .DSABL  LSB
```

```
                                01CB   749          .SBTTL  CVT_TO_SYS - Convert to system owned lock
                                01CB   750
                                01CB   751 ;++
                                01CB   752 ; FUNCTIONAL DESCRIPTION:
                                01CB   753 ;
                                01CB   754 ;       This routine converts a lock from process owned to system owned
                                01CB   755 ;
                                01CB   756 ; CALLING SEQUENCE:
                                01CB   757 ;
                                01CB   758 ;       BSBW    CVT_TO_SYS
                                01CB   759 ;       BSBW    CVT_TO_SYS_INT  (Internal entry point w/o error checking)
                                01CB   760 ;       IPL must be at IPL$_SYNCH
                                01CB   761 ;       NOTE:  Errors are passed to error exit, not returned to caller
                                01CB   762 ;
                                01CB   763 ; INPUTS:
                                01CB   764 ;
                                01CB   765 ;       R1      Access mode of caller (CVT_TO_SYS entry only)
                                01CB   766 ;       R4      Address of PCB
                                01CB   767 ;       R6      Address of LKB
                                01CB   768 ;
                                01CB   769 ; OUTPUTS:
                                01CB   770 ;
                                01CB   771 ;       R0      Completion code (returned to error handler, not caller)
                                01CB   772 ;
                                01CB   773 ; COMPLETION CODES:
                                01CB   774 ;
                                01CB   775 ;       SS$_NOPRIV      Caller wasn't in EXEC or KERNEL mode
                                01CB   776 ;       SS$_PARNOTSYS   Parent lock is not a system lock
                                01CB   777 ;
                                01CB   778 ; SIDE EFFECTS:
                                01CB   779 ;
                                01CB   780 ;       R0 is destroyed
                                01CB   781 ;--
                                01CB   782
                                01CB   783          .ENABL  LSB
                                01CB   784
                                01CB   785 CVT_TO_SYS:
                                01CB   786          ; Verify that caller is in EXEC or KERNEL mode and that
                                01CB   787          ; this lock's parent lock is also system owned.
                                01CB   788
    01      51      91          01CB   789          CMPB    R1,#PSL$C_EXEC          ; Is caller privileged?
            2B      1A          01CE   790          BGTRU   70$                     ; No, error
 50     48  A6      D0          01D0   791          MOVL    LKB$L_PARENT(R6),R0     ; Get parent LKB address
            05      13          01D4   792          BEQL    CVT_TO_SYS_INT          ; No parent
            06      E1          01D6   793          BBC     #LCK$V_CVTSYS,-         ; Branch if parent not system owned
      25 28 A0                  01D8   794                  LKB$W_FLAGS(R0),80$
                                01DB   795
                                01DB   796 CVT_TO_SYS_INT:
                                01DB   797          ; Request passed all error checks, do the conversion to system owned.
                                01DB   798          ; Return quota to process, if charged, clear the lock's PID
                                01DB   799          ; and remove from the process's lock queue.
                                01DB   800
            20      B3          01DB   801          BITW    #LKB$M_NOQUOTA,-        ; Was quota charged?
          2A A6                 01DD   802                  LKB$W_STATUS(R6)
            0C      12          01DF   803          BNEQ    20$                     ; No
 50   0080 C4      D0          01E1   804          MOVL    PCB$L_JIB(R4),R0        ; Yes, get address of JIB
          4C A0     B6          01E6   805          INCW    JIB$W_ENQCNT(R0)        ; Return quota
```

```
                20   A8  01E9    806          BISW    #LKB$M_NOQUOTA,-        ; Set NOQUOTA bit
              2A A6       01EB    807                  LKB$W_STATUS(R6)
                          01ED    808
              0C A6   D4  01ED    809 20$:     CLRL    LKB$L_PID(R6)           ; Clear PID
           50   40 A6   0F  01F0    810          REMQUE  LKB$L_OWNQFL(R6),R0     ; Remove from PCB queue
            0040 8F   A8  01F4    811          BISW    #LCK$M_CVTSYS,-         ; Set this flag in case we are
              28 A6       01F8    812                  LKB$W_FLAGS(R6)         ; cancelling or we have a NOQUEUE
                          01FA    813                                          ; situation (it got cleared)
                    05    01FA    814          RSB
                          01FB    815
                          01FB    816          ;
                          01FB    817          ; Errors
                          01FB    818          ;
           50   24   3C   01FB    819 70$:     MOVZWL  #SS$_NOPRIV,R0
                05   11   01FE    820          BRB     90$
        50  225C 8F   3C   0200    821 80$:     MOVZWL  #SS$_PARNOTSYS,R0
                033B 31   0205    822 90$:     BRW     ERROR_EXIT_R0
                          0208    823
                          0208    824          .DSABL  LSB
```

```
                     0208    826          .SBTTL  CVT_TO_PRC - Convert to process owned lock
                     0208    827
                     0208    828 ;++
                     0208    829 ; FUNCTIONAL DESCRIPTION:
                     0208    830 ;
                     0208    831 ;       This routine converts a lock from system owned to process owned
                     0208    832 ;
                     0208    833 ; CALLING SEQUENCE:
                     0208    834 ;
                     0208    835 ;       BSBW    CVT_TO_PRC
                     0208    836 ;       IPL must be at IPL$_SYNCH
                     0208    837 ;       NOTE:  Errors are passed to error exit, not returned to caller
                     0208    838 ;
                     0208    839 ; INPUTS:
                     0208    840 ;
                     0208    841 ;       R4      Address of PCB
                     0208    842 ;       R6      Address of LKB
                     0208    843 ;       R9      Input flags
                     0208    844 ;
                     0208    845 ; OUTPUTS:
                     0208    846 ;
                     0208    847 ;       R0      Completion code (returned to error handler, not caller)
                     0208    848 ;
                     0208    849 ; COMPLETION CODES:
                     0208    850 ;
                     0208    851 ;       SS$_EXENQLM     Exceeded enqueue quota
                     0208    852 ;       SS$_SUBLOCKS    System owned locks with sublocks cannot be converted
                     0208    853 ;                       to process owned locks
                     0208    854 ;
                     0208    855 ; SIDE EFFECTS:
                     0208    856 ;
                     0208    857 ;       R0 is destroyed
                     0208    858 ;--
                     0208    859
                     0208    860 CVT_TO_PRC:
                     0208    861         ; Verify that this lock has no sublocks
                     0208    862
                4C A6   B5   0208    863         TSTW    LKB$W_REFCNT(R6)        ; Are there any sublocks?
                    2F   12  020B    864         BNEQ    80$                     ; Yes, error
                         020D    865
                         020D    866         ; Charge quota unless NOQUOTA bit is set
                         020D    867
                59   20   B3  020D    868         BITW    #LCK$M_NOQUOTA,R9       ; Charge quota?
                     0E   12  0210    869         BNEQ    20$                     ; No
            50   0080 C4   D0  0212    870         MOVL    PCB$L_JIB(R4),R0        ; Yes, get JIB address
                4C A0   B7   0217    871         DECW    JIB$W_ENQCNT(R0)        ; Charge one
                    16   19  021A    872         BLSS    70$                     ; No quota - error
                    20   AA  021C    873         BICW    #LKB$M_NOQUOTA,-        ; Indicate it was charged
                  2A A6         021E    874                 LKB$W_STATUS(R6)
                         0220    875
                         0220    876 20$:    ; Store PID and insert onto PCB lock queue
                         0220    877
                0080 8F   A8  0220    878         BISW    #LKB$M_WASSYSOWN,-      ; Set status bit to indicate lock was
                  2A A6         0224    879                 LKB$W_STATUS(R6)        ; system owned
                  60 A4   D0  0226    880         MOVL    PCB$L_PID(R4),-         ; Store PID
                  0C A6         0229    881                 LKB$L_PID(R6)
                  40 A6   0E  022B    882         INSQUE  LKB$L_OWNQFL(R6),-      ; Insert at head of PCB queue
```

```
                0104 C4          022E   883                     PCB$L_LOCKQFL(R4)
                         05      0231   884             RSB
                                 0232   885
                                 0232   886 ;
                                 0232   887 ;           Errors
                                 0232   888 ;
                                 0232   889
                   4C A0    B6  0232   890 70$:        INCW    JIB$W_ENQCNT(R0)        ; Put back charged quota
                50 2A44 8F    3C  0235   891             MOVZWL  #SS$_EXENQLM,R0
                      05      11  023A   892             BRB     90$
                50 212C 8F    3C  023C   893 80$:        MOVZWL  #SS$_SUBLOCKS,R0
                    02FF      31  0241   894 90$:        BRW     ERROR_EXIT_R0
```

```
0244   896          .SBTTL  NEW_LOCK - New lock request (not conversion)
0244   897
0244   898 ; FUNCTIONAL DESCRIPTION:
0244   899 ;
0244   900 ;       This routine handles requests for new locks, as opposed to
0244   901 ;       conversions.  This routine eventually branches to NEW_RESOURCE
0244   902 ;       or OLD_RESOURCE depending on whether the resource already
0244   903 ;       exists or not.
0244   904 ;
0244   905 ; CALLING SEQUENCE:
0244   906 ;
0244   907 ;       Branched to from $ENQ service
0244   908 ;       RET back to caller
0244   909 ;
0244   910 ; INPUTS:
0244   911 ;
0244   912 ;       R3      Event flag number
0244   913 ;       R4      Address of PCB
0244   914 ;       R7      Lock mode
0244   915 ;       R8      Address of LKSB
0244   916 ;       R9      Flags
0244   917 ;
0244   918 ;       Caller's argument list (offsets from AP)
0244   919 ;
0244   920 ; OUTPUTS:
0244   921 ;
0244   922 ;       R0      Completion code
0244   923 ;
0244   924 ; IMPLICIT OUTPUTS:
0244   925 ;
0244   926 ;       Caller's lock status block gets final request status (perhaps
0244   927 ;       aynchronously)
0244   928 ;
0244   929 ; COMPLETION CODES:
0244   930 ;
0244   931 ;   In R0:
0244   932 ;
0244   933 ;       SS$_NORMAL              Successful completion
0244   934 ;       SS$_SYNCH               Synchronous successful completion
0244   935 ;       SS$_IVLOCKID            Invalid lock id
0244   936 ;       SS$_ACCVIO              Access violation (on resource name)
0244   937 ;       SS$_PARNOTGRANT         Parent lock not granted
0244   938 ;       SS$_NOSYSLCK            No SYSLCK privilege (needed for a system lock)
0244   939 ;       SS$_IVBUFLEN            Resource name length = 0 or > 31
0244   940 ;       SS$_INSFMEM             Insufficient dynamic memory
0244   941 ;       SS$_EXENQLM             Exceeded enqueue quota
0244   942 ;       SS$_NOTQUEUED           Request was not queued
0244   943 ;       SS$_NOPRIV              No privilege (to not charge quota)
0244   944 ;
0244   945 ;   In LKSB:
0244   946 ;
0244   947 ;       SS$_NORMAL              Successful completion
0244   948 ;       SS$_DEADLOCK            Deadlock detected
0244   949 ;       SS$_ABORT               Lock was dequeued before being granted
0244   950 ;--
0244   951
0244   952          .IF NDF LOADSW
```

```
                                                D 16
                     0000004C   953          .PSECT  Y$EXEPAGED
                          004C   954          .ENDC
                          004C   955
                          004C   956          .ENABL  LSB
                          004C   957
                          004C   958 ;
                          004C   959 ; Errors:
                          004C   960 ;
                          004C   961
          50    0C    3C  004C   962 ACCVIO: MOVZWL  S^#SS$_ACCVIO,R0        ; Access violation on res. name or LKSB
                05    11  004F   963         BRB     8$
     50   034C  8F    3C  0051   964 2$:     MOVZWL  #SS$_IVBUFLEN,R0        ; Invalid length for resource name
      00000543'EF    17  0056   965 8$:     JMP     ERROR_EXIT_R0
                          005C   966
                          005C   967 NEW_LOCK:
                          005C   968
                          005C   969          ; Get pointer to resource name, probe it, and check the length
                          005C   970          ; for legality (0 < length <= RSB$K_MAXLEN).
                          005C   971
          50    14 AC   D0  005C   972          MOVL    RESNAM(AP),R0           ; Get address of resource name descriptor
                          0060   973          IFNORD  #8,(R0),ACCVIO          ; Branch if descriptor not readable
             5A 60    7D  0066   974          MOVQ    (R0),R10                ; Get length (R10) and address (R11)
             5A 5A    3C  0069   975          MOVZWL  R10,R10                 ; Clear top half of length
                E3    13  006C   976          BEQL    2$                      ; Error, length is zero
                          006E   977          ASSUME  RSB$K_MAXLEN LE 512
             1F 5A    D1  006E   978          CMPL    R10,#RSB$K_MAXLEN       ; Is length > maximum allowed?
                DE    1A  0071   979          BGTRU   2$                      ; Yes, error, length is too big
                          0073   980          IFNORD  R10,(R11),ACCVIO        ; Branch if string not readable
                          0079   981
                          0079   982          ; Allocate a lock block.
                          0079   983          ; NOTE:  There is an implicit assumption here (unchecked!) that
                          0079   984          ;        the minimum size of an SRP is 96 bytes.
                          0079   985
                          0079   986          ASSUME  LKB$K_LENGTH  LE  96
                          0079   987          ASSUME  LKB$B_TYPE  EQ  LKB$W_SIZE+2
                          0079   988
                          0079   989          SETIPL  #IPL$_ASTDEL            ; Raise IPL (to allocate pool)
     50   00000000'GF    DE  007C   990          MOVAL   G^IOC$GL_SRPFL,R0       ; *** Combine this and the following
                          0083   991                                          ; instruction when loading is resolved
          52    00 B0    0F  0083   992          REMQUE  @(R0),R2                ; Try lookaside list
                10    1C  0087   993          BVC     10$                     ; Have one
          51    0060 8F    3C  0089   994          MOVZWL  #LKB$K_LENGTH,R1        ; List empty - do it the hard way
                50    D4  008E   995          CLRL    R0                      ; No cleanup routine needed
          00000000'GF    16  0090   996          JSB     G^EXE$ALONPAGWAIT       ; Allocate; wait if necessary
                BD    50  E9  0096   997          BLBC    R0,8$                   ; None there and resource wait off
             56    52    D0  0099   998 10$:     MOVL    R2,R6                   ; R6 will point to LKB
  08 A6   00350060 8F    D0  009C   999          MOVL    #<DYN$C_LKB@16>!-       ; Store size and type fields
                          00A4  1000                  LKB$K_LENGTH,LKB$W_SIZE(R6)
                          00A4  1001
                          00A4  1002          ; Fill in various fields in LKB
                          00A4  1003
                          00A4  1004          ASSUME  ASTPRM  EQ  ASTADR+4
                          00A4  1005          ASSUME  LKB$B_GRMODE  EQ  LKB$B_RQMODE+1
                          00A4  1006
          37 A6    53   90  00A4  1007          MOVB    R3,LKB$B_EFN(R6)        ; Store event flag number
          34 A6    57   9B  00A8  1008          MOVZBW  R7,LKB$B_RQMODE(R6)     ; Store req. mode; clear granted mode
          24 A6    58   D0  00AC  1009          MOVL    R8,LKB$L_LKSB(R6)       ; Store LKSB address
```

```
                1C AC    D0  00B0  1010          MOVL    ASTADR(AP),-                ; Store completion AST address
                1C A6        00B3  1011                  LKB$L_CPLASTADR(R6)
                24 AC    D0  00B5  1012          MOVL    BLKAST(AP),-                ; Store blocking AST address
                20 A6        00B8  1013                  LKB$L_BLKASTADR(R6)
                20 AC    D0  00BA  1014          MOVL    ASTPRM(AP),-                ; Store AST parameter
                14 A6        00BD  1015                  LKB$L_ASTPRM(R6)
                60 A4    D0  00BF  1016          MOVL    PCB$L_PID(R4),-             ; Store PID
                0C A6        00C2  1017                  LKB$L_PID(R6)
                4C A6    B4  00C4  1018          CLRW    LKB$W_REFCNT(R6)            ; Clear sub LKB reference count
                             00C7  1019
                             00C7  1020          ; Allocate a resource block (RSB).  This is done now because the
                             00C7  1021          ; resource name must be copied from the caller's buffer to a system
                             00C7  1022          ; one before it is used.  It is copied right into the
                             00C7  1023          ; resource block because the common case is that the resource does
                             00C7  1024          ; not currently exist.  If we later find the resource, this RSB
                             00C7  1025          ; will be deallocated.
                             00C7  1026
          51    50 AA    9E  00C7  1027          MOVAB   RSB$K_LENGTH(R10),R1        ; Add length of name to fixed size
00000000'GF       51    D1  00CB  1028          CMPL    R1,G^IOC$GL_SRPSIZE         ; Will it fit in a SRP?
                  25    1A  00D2  1029          BGTRU   15$                         ; No
50    00000000'GF       DE  00D4  1030          MOVAL   G^IOC$GL_SRPFL,R0           ; *** Combine this and the following
                             00DB  1031                                              ; instruction when loading is resolved
          52    00 B0    0F  00DB  1032          REMQUE  @(R0),R2                    ; Try lookaside list
                  18    1D  00DF  1033          BVS     15$                         ; Didn't get one
                             00E1  1034
                             00E1  1035 13$:     ; Continue building RSB and LKB
                             00E1  1036
                             00E1  1037          ASSUME  RSB$B_TYPE  EQ  RSB$W_SIZE+2
                             00E1  1038          ASSUME  RSB$B_DEPTH  EQ  RSB$B_TYPE+1
                             00E1  1039
          08 A2    51    3C  00E1  1040          MOVZWL  R1,RSB$W_SIZE(R2)           ; Store size of RSB and zero depth
             58    52    D0  00E5  1041          MOVL    R2,R8                       ; R8 will point to RSB
                             00E8  1042
                             00E8  1043          ; Copy resource name to RSB and branch to non-paged PSECT.
                             00E8  1044
             57    54    D0  00E8  1045          MOVL    R4,R7                       ; Save PCB address
50 A8        6B    5A    28  00EB  1046          MOVC3   R10,(R11),RSB$T_RESNAM(R8) ; R0 - R5 not valid anymore
             54    57    D0  00F0  1047          MOVL    R7,R4                       ; Restore PCB address
     00000255'EF          17  00F3  1048          JMP     40$                         ; Branch to non-paged PSECT
                             00F9  1049
                             00F9  1050 15$:     ; Need to allocate a RSB from pool because it either won't fit
                             00F9  1051          ; in a SRP or the SRP list is empty.
                             00F9  1052
50   0000058E'EF          9E  00F9  1053          MOVAB   L^CLEANUP4,R0               ; Set address of cleanup routine
     00000000'GF          16  0100  1054          JSB     G^EXE$ALONPAGWAIT           ; Allocate.  Wait if necessary.
           D8 50          E8  0106  1055          BLBS    R0,13$                      ; Have one
              58          D4  0109  1056          CLRL    R8                          ; Error, indicate no RSB to deallocate
     0000024C'EF          17  010B  1057          JMP     27$                         ; Deallocate LKB and return
                             0111  1058
                             0111  1059          .IF NDF LOADSW
                        00000244  1060          .PSECT  LOCKMGR
                             0244  1061          .ENDC
                             0244  1062
                             0244  1063 ;*******************************************************************************
                             0244  1064 ;
                             0244  1065 ;       Errors
                             0244  1066 ;
```

```
                                0244  1067 ;****************************************************************************
                                0244  1068
                                0244  1069         ; CLEANUP3 errors
                                0244  1070
50   2134 8F    3C              0244  1071 23$:     MOVZWL  #SS$_PARNOTGRANT,R0     ; Parent lock not granted
     56   53    D0              0249  1072 25$:     MOVL    R3,R6                   ; Restore address of LKB
     5B   50    D0              024C  1073 27$:     MOVL    R0,R11                  ; Save completion code
            0331 30              024F  1074          BSBW    CLEANUP3                ; Deallocate LKB and RSB; then exit
              02EB 31            0252  1075          BRW     ERROR_EXIT_R11
                                0255  1076
                                0255  1077
                                0255  1078 40$:     ; Get parent id and convert to parent LKB if non-zero.  If a parent is
                                0255  1079          ; specified get parent RSB address (in R7) and get resource access mode
                                0255  1080          ; from parent RSB.  Otherwise, R7 = 0 so we get resource access mode
                                0255  1081          ; from argument list (maximized with caller's access mode, of course).
                                0255  1082          ; Note that we raise to IPL$_SYNCH here.  After this is performed,
                                0255  1083          ; there can be no further references to the caller's address space.
                                0255  1084
                                0255  1085          ASSUME  LKB$K_GRANTED  GT  0
                                0255  1086          ASSUME  LKB$K_CONVERT  EQ  0
                                0255  1087          ASSUME  RSB$B_RMOD  EQ  RSB$W_GROUP+2
                                0255  1088
     53   56    D0              0255  1089          MOVL    R6,R3                   ; Save LKB address
          57    D4              0258  1090          CLRL    R7                      ; Assume no parent RSB
56   18 AC    D0              025A  1091          MOVL    PARID(AP),R6            ; Get parent id
          23    13              025E  1092          BEQL    45$                     ; Branch if no parent specified
                                0260  1093          SETIPL  #IPL$_SYNCH             ; Raise IPL
     51   56    D0              0263  1094          MOVL    R6,R1                   ; Move parent id
            0703 30              0266  1095          BSBW    VERIFYPARLOCKID         ; Get LKB in R6 and caller's access mode
          DD 50  E9              0269  1096          BLBC    R0,25$                  ; in R1.  Branch if error
          36 A6  95              026C  1097          TSTB    LKB$B_STATE(R6)         ; Is parent lock in grant or cvt state?
          05     18              026F  1098          BGEQ    43$                     ; Yes
          01     E1              0271  1099          BBC     #LCK$V_CONVERT,-        ; No, but if CONVERT bit is set, then
                    CE 28 A6            0273  1100                  LKB$W_FLAGS(R6),23$ ; it's okay as lock is in a transient
                                0276  1101                                          ; convert state.  Otherwise, error!
57   50 A6    D0              0276  1102 43$:     MOVL    LKB$L_RSB(R6),R7        ; Yes, get parent RSB address
50   4C A7    D0              027A  1103          MOVL    RSB$W_GROUP(R7),R0      ; Get parent's group and res. acmode
     4C A6    B6              027E  1104          INCW    LKB$W_REFCNT(R6)        ; Increment parent's sub LKB ref. count
          1C    11              0281  1105          BRB     50$
                                0283  1106
                                0283  1107 45$:     ; No parent LKB so get specified access mode and maximize with
                                0283  1108          ; caller's access mode.
                                0283  1109
          50    DC              0283  1110          MOVPSL  R0                      ; Read current PSL
          16    EF              0285  1111          EXTZV   #PSL$V_PRVMOD,-         ; Extract previous mode field
     51   50    02              0287  1112                  #PSL$S_PRVMOD,R0,R1
50   28 AC  FC 8F    88        028A  1113          BICB3   #^C<3>,ACMODE(AP),R0    ; Get specified access mode
                                0290  1114          SETIPL  #IPL$_SYNCH             ; Raise IPL
          50   51    91        0293  1115          CMPB    R1,R0                   ; Compare with caller's access mode
          03    1F              0296  1116          BLSSU   47$                     ; Use specified access mode (R0)
          50   51    90        0298  1117          MOVB    R1,R0                   ; Use caller's access mode (R1)
     50   50   10    78        029B  1118 47$:     ASHL    #16,R0,R0               ; Move to bits <16:23>
                                029F  1119
                                029F  1120 50$:     ; Store parent LKB address or 0 (in R6).  Then store caller's
                                029F  1121          ; access mode with NODELETE bit set (caller's access mode is in R1,
                                029F  1122          ; resource access mode is in R0 <16:23>).
                                029F  1123
```

```
                                029F  1124          ASSUME  LKB$B_RMOD  EQ  ACB$B_RMOD
                                029F  1125          ASSUME  LKB$M_NODELETE  EQ  ACB$M_NODELETE
                                029F  1126
          48 A3    56    D0     029F  1127          MOVL    R6,LKB$L_PARENT(R3)     ; Store parent LKB ptr in new LKB
             56    53    D0     02A3  1128          MOVL    R3,R6                   ; Restore LKB address
       0B A6    51    20    89  02A6  1129          BiSB3   #LKB$M_NODELETE,R1,-    ; Store access mode in LKB and set
                                02AB  1130                  LKB$B_RMOD(R6)          ; no delete bit
             55    51    D0     02AB  1131          MOVL    R1,R5                   ; Move access mode
                                02AE  1132
                                02AE  1133          ; R0 <16:23> contains resource access mode;  R0 <0:15> contains
                                02AE  1134          ; parent's group if there is a parent.  R5 contains
                                02AE  1135          ; caller's access mode;  R7 contains parent RSB address or 0.
                                02AE  1136          ; Store composite group number and access mode in RSB.
                                02AE  1137
                                02AE  1138          ASSUME  RSB$W_GROUP  EQ  RSB$L_PARENT+4
                                02AE  1139          ASSUME  RSB$B_RMOD  EQ  RSB$W_GROUP+2
                                02AE  1140
             51    50    D0     02AE  1141          MOVL    R0,R1                   ; Move composite fields
             50    57    D0     02B1  1142          MOVL    R7,R0                   ; Move parent RSB address
                   17    12     02B4  1143          BNEQ    53$                     ; Store if this is a sub-lock
             59    10    B3     02B6  1144          BITW    #LCK$M_SYSTEM,R9        ; Is this a system name?
                   07    12     02B9  1145          BNEQ    52$                     ; Yes
          51   00BE  C4    B0  02BB  1146          MOVW    PCB$W_GRP(R4),R1        ; Group name - store group number
                   0B    11     02C0  1147          BRB     53$
             01    55    91     02C2  1148  52$:    CMPB    R5,#PSL$C_EXEC          ; System name - allow without priv. if
                   06    1B     02C5  1149          BLEQU   53$                     ; caller is from EXEC or KERNEL mode
                                02C7  1150          IFNPRIV SYSLCK,61$              ; SUPER or USER mode needs privilege
          48 A8    50    7D     02CD  1151  53$:    MOVQ    R0,RSB$L_PARENT(R8)     ; Store parent, group, acmode in RSB
          4F A8    5A    90     02D1  1152          MOVB    R10,RSB$B_RSNLEN(R8)    ; Store resource name lenght in RSB
             2A A6    B4        02D5  1153          CLRW    LKB$W_STATUS(R6)        ; Clear status bits
                                02D8  1154
                                02D8  1155          ; See if any special operations must be performed.
                                02D8  1156          ; The caller's mode is in R5.  The PCB address is in R4.
                                02D8  1157
       59   01E0  8F    B3     02D8  1158          BITW    #LCK$M_RECOVER-         ; Any special bits set?
                                02DD  1159                  !LCK$M_PROTECT-
                                02DD  1160                  !LCK$M_NOQUOTA-
                                02DD  1161                  !LCK$M_CVTSYS,R9
                   3E    13     02DD  1162          BEQL    59$                     ; No
                                02DF  1163
                                02DF  1164          ; If RECOVER bit is set, then verify process has privilege to set
                                02DF  1165          ; it and if so, also set the PROTECT and NOQUEUE bits.
                                02DF  1166
       0A 59    07    E1     02DF  1167          BBC     #LCK$V_RECOVER,R9,54$   ; Branch if RECOVER is not set
                   1A    E1     02E3  1168          BBC     #PCB$V_RECOVER,-        ; Branch if no privilege
             4F 24 A4           02E5  1169                  PCB$L_STS(R4),62$
       59   0104  8F    A8     02E8  1170          BISW    #LCK$M_NOQUEUE!LCK$M_PROTECT,R9 ; Set related bits
                                02ED  1171
                                02ED  1172  54$:    ; If PROTECT is set, then set corresponding bit in status
                                02ED  1173
       06 59    08    E1     02ED  1174          BBC     #LCK$V_PROTECT,R9,55$   ; Branch if PROTECT is not set
             0200  8F    A8     02F1  1175          BISW    #LKB$M_PROTECT,-        ; Set PROTECT bit is status
                2A A6           02F5  1176                  LKB$W_STATUS(R6)
                                02F7  1177
                                02F7  1178  55$:    ; If CVTSYS is set, then verify caller is from EXEC or KERNEL
                                02F7  1179          ; mode and that parent lock is system owned.  Then also set
                                02F7  1180          ; NOQUEUE and SYNCSTS bits and clear PID.
```

```
                     02F7  1181
                     02F7  1182          BBC     #LCK$V_CVTSYS,R9,57$    ; Branch if CVTSYS is not set
50   48 A6   D0     02FB  1183          MOVL    LKB$L_PARENT(R6),R0     ; Get parent LKB address
        05   13     02FF  1184          BEQL    56$                     ; No parent
     0C A0   D5     0301  1185          TSTL    LKB$L_PID(R0)           ; Is parent system owned?
        23   12     0304  1186          BNEQ    60$                     ; No, error
   59   0C   A8     0306  1187 56$:     BISW    #LCK$M_SYNCSTS!LCK$M_NOQUEUE,R9 ; Set related bits
     0C A6   D4     0309  1188          CLRL    LKB$L_PID(R6)           ; Clear PID
        04   11     030C  1189          BRB     58$                     ; Do access mode check
                     030E  1190
                     030E  1191 57$:     ; If NOQUOTA is set, then verify caller is from EXEC or KERNEL
                     030E  1192          ; mode and set internal NOQUOTA bit.
                     030E  1193
0B 59   05   E1     030E  1194          BBC     #LCK$V_NOQUOTA,R9,59$   ; Branch if NOQUOTA is not set
   01   55   91     0312  1195 58$:     CMPB    R5,#PSL$C_EXEC          ; Is access mode EXEC or KERNEL?
        20   1A     0315  1196          BGTRU   62$                     ; No - error
        20   A8     0317  1197          BISW    #LKB$M_NOQUOTA,-        ; Yes, set NOQUOTA status
     2A A6          0319  1198                  LKB$W_STATUS(R6)
        63   11     031B  1199          BRB     65$
                     031D  1200
54 0080 C4   D0     031D  1201 59$:     MOVL    PCB$L_JIB(R4),R4        ; Get pointer to JIB
     4C A4   B7     0322  1202          DECW    JIB$W_ENQCNT(R4)        ; Decrement enqueue count remaining
        59   18     0325  1203          BGEQ    65$                     ; Quota ok
        1D   11     0327  1204          BRB     67$                     ; No quota - error
                     0329  1205
                     0329  1206 ;****************************************************************************
                     0329  1207 ;
                     0329  1208 ;       Error branches and out of line code
                     0329  1209 ;
                     0329  1210 ;****************************************************************************
                     0329  1211
                     0329  1212          ; CLEANUP2 errors
                     0329  1213
5B 225C 8F   3C     0329  1214 60$:     MOVZWL  #SS$_PARNOTSYS,R11      ; Parent not system owned
        0A   11     032E  1215          BRB     64$
5B 28F4 8F   3C     0330  1216 61$:     MOVZWL  #SS$_NOSYSLCK,R11       ; No privilege for system lock
        03   11     0335  1217          BRB     64$
   5B   24   3C     0337  1218 62$:     MOVZWL  S^#SS$_NOPRIV,R11       ; No privilege
     023B   30     033A  1219 64$:     BSBW    CLEANUP2                ; Cleanup
        0F   11     033D  1220          BRB     69$
                     033F  1221
                     033F  1222          ; CLEANUP1 errors
                     033F  1223
5B 0E32 8F   3C     033F  1224 66$:     MOVZWL  #SS$_RETRY,R11          ; Retry operation
        05   11     0344  1225          BRB     68$
5B 2A44 8F   3C     0346  1226 67$:     MOVZWL  #SS$_EXENQLM,R11        ; Exceeded enqueue quota
     0216   30     034B  1227 68$:     BSBW    CLEANUP1                ; Cleanup (deallocate LKB, RSB, etc.)
                     034E  1228
     01EF   31     034E  1229 69$:     BRW     ERROR_EXIT_R11
                     0351  1230
                     0351  1231          ; OUT OF LINE CODE
                     0351  1232
                     0351  1233 70$:     ; We are stalling some lock requests.  R0 (low byte) contains
                     0351  1234          ; stall flag.  See if this request should be stalled.  Stall values
                     0351  1235          ; are:
                     0351  1236          ;
                     0351  1237          ;       -1      Stall all requests
```

```
                                0351  1238          ;       +1      Stall only protected locks (not being recovered)
                                0351  1239          ;       +2      Stall protected locks and root locks
                                0351  1240
          17   19               0351  1241          BLSS    74$                             ; We are stalling all requests
       02 50   91               0353  1242          CMPB    R0,#2                           ; Are we stalling root locks?
          05   19               0356  1243          BLSS    72$                             ; No
        48 A6  D5               0358  1244          TSTL    LKB$L_PARENT(R6)                ; Yes, is this a root lock?
          0D   13               035B  1245          BEQL    74$                             ; Yes, stall this request
    2C 59  08   E1               035D  1246 72$:     BBC     #LCK$V_PROTECT,R9,90$           ; Don't stall unprotected locks
    28 59  07   E0               0361  1247          BBS     #LCK$V_RECOVER,R9,90$           ; Don't stall recovering a lock
          1A   E0               0365  1248          BBS     #PCB$V_RECOVER,-                ; Don't stall recovery process,
       D5 24 A4                 0367  1249                  PCB$L_STS(R4),66$               ; return error instead
        01F7   30               036A  1250 74$:     BSBW    CLEANUP1                        ; Cleanup
        0920   31               036D  1251          BRW     STALL_REQ                       ; Stall this request
                                0370  1252
                                0370  1253 75$:     ; No lockids.   Try extending table
                                0370  1254
    50  0564'CF   9E            0370  1255          MOVAB   W^CLEANUP1,R0                   ; Address of cleanup routine
        0944   30               0375  1256          BSBW    LCK$EXTEND_IDTBLW               ; Try extending table
          12 50  E8             0378  1257          BLBS    R0,90$                          ; Success
       5B   50  D0              037B  1258          MOVL    R0,R11                          ; Failure, move status
          CB   11               037E  1259          BRB     68$                             ; Cleanup
                                0380  1260
                                0380  1261 ;*****************************************************************************
                                0380  1262 ;
                                0380  1263 ;       End error branches and out of line code
                                0380  1264 ;
                                0380  1265 ;*****************************************************************************
                                0380  1266
                                0380  1267 85$:     ; Store flags and stall this lock request, if necessary.
                                0380  1268
        28 A6   59   B0         0380  1269          MOVW    R9,LKB$W_FLAGS(R6)              ; Store flags
    50  00000000'GF  90         0384  1270          MOVB    G^LCK$GB_STALLREQS,R0           ; Are we stalling requests?
                C4   12         038B  1271          BNEQ    70$                             ; Yes
                                038D  1272
                                038D  1273 90$:     ; Allocate a lock id and point the id slot to this LKB.
                                038D  1274
    50  00000000'GF  D0         038D  1275          MOVL    G^LCK$GL_NXTID,R0               ; Get next lock id
                DA   13         0394  1276          BEQL    75$                             ; No more - try expanding table
    51  00000000'GF  D0         0396  1277          MOVL    G^LCK$GL_IDTBL,R1               ; Get address of lock id table.  *** May
                                039D  1278                                                  ; combine with next instr. if no loading
        30 A6   50   B0         039D  1279          MOVW    R0,LKB$L_LKID(R6)               ; Store lockid index
          51   6140  DE         03A1  1280          MOVAL   (R1)[R0],R1                     ; Get address of lockid table entry
00000000'GF    61   3C         03A5  1281          MOVZWL  (R1),G^LCK$GL_NXTID             ; Update ptr to next free id
    32 A6   02  A1   B0         03AC  1282          MOVW    2(R1),LKB$L_LKID+2(R6)          ; Store lockid sequence number
          61   56   D0         03B1  1283          MOVL    R6,(R1)                         ; Store LKB address in table entry
                                03B4  1284
                                03B4  1285          ; Now hash resource name and search hash table for a matching
                                03B4  1286          ; name and parent RSB address.
                                03B4  1287
        54   48 A8   9E         03B4  1288          MOVAB   RSB$L_PARENT(R8),R4             ; Point to parent, group, resnam, etc.
          5A   08   C0          03B8  1289          ADDL    #8,R10                          ; Account for parent RSB, group, etc.
             01DE   30          03BB  1290          BSBW    LCK$HASH_SEARCH                 ; Hash and search the table for a match
            72 50   E8          03BE  1291          BLBS    R0,NEW_RESOURCE                 ; Didn't find one
                                03C1  1292                                                  ; Found one - fall through to ...
                                03C1  1293
                                03C1  1294
```

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                03C1  1295          .DSABL  LSB
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```
                        03C1  1297          .IF NDF LOADSW
                    000003C1  1298          .PSECT  LOCKMGR
                        03C1  1299          .ENDC
                        03C1  1300
                        03C1  1301 OLD_RESOURCE:
                        03C1  1302          ; Found a matching resource block (RSB).  Address of RSB is in R5.
                        03C1  1303          ; Address of LKB is in R6.  First deallocate the temporary RSB
                        03C1  1304          ; pointed to by R8.  If anyone is waiting
                        03C1  1305          ; (in either the waiting queue or the conversion queue), then
                        03C1  1306          ; this request must also wait.  If no one is waiting, then this
                        03C1  1307          ; lock can be granted if it is compatible with the group grant mode.
                        03C1  1308
    50    58    D0      03C1  1309          MOVL    R8,R0
00000000'GF    16      03C4  1310          JSB     G^EXE$DEANONPAGED       ; Deallocate temporary RSB
    58    55    D0      03CA  1311          MOVL    R5,R8                   ; Use R8 from now on for RSB address
 50 A6    58    D0      03CD  1312          MOVL    R8,LKB$L_RSB(R6)        ; Store RSB pointer in LKB
                        03D1  1313
                        03D1  1314          ; If this resource is being handled remotely, then send a remote
                        03D1  1315          ; lock request.  Otherwise do it here.
                        03D1  1316
 53   38 A8    D0      03D1  1317          MOVL    RSB$L_CSID(R8),R3       ; Get CSID of system managing this
          56    12      03D5  1318          BNEQ    REM_LOCK                ; resource and branch if it's not us
                        03D7  1319
                        03D7  1320 LCK$LOCAL_LOCK::
                        03D7  1321          ; Return here to handle locks locally after a directory lookup.
                        03D7  1322
                        03D7  1323          ASSUME  RSB$L_WTQFL  EQ  RSB$L_CVTQFL+8
                        03D7  1324
              00000002  03D7  1325          .IF NE  CA$_MEASURE
      00000000'GF    D6  03D7  1326          INCL    G^PMS$GL_ENQNEW_LOC
                        03DD  1327          .ENDC
                        03DD  1328
    50    18 A8    CE  03DD  1329          MOVAL   RSB$L_CVTQFL(R8),R0     ; Get address of conversion queue
       60    50    D1  03E1  1330          CMPL    R0,(R0)                 ; Queue empty?
             2A    12  03E4  1331          BNEQ    70$                     ; No
          50    08    C0  03E6  1332          ADDL    #8,R0                   ; Get address of wait queue
          51    50    D0  03E9  1333          MOVL    R0,R1                   ; Save in R1
          51    60    D1  03EC  1334 60$:     CMPL    (R0),R1                 ; Is this the end of the queue?
             15    12  03EF  1335          BNEQ    65$                     ; No
                        03F1  1336
                        03F1  1337 62$:     ; No waiting requests (or RECOVER bit is set); is the lock compatible?
                        03F1  1338
       51    34 A6    9A  03F1  1339          MOVZBL  LKB$B_RQMODE(R6),R1     ; Get lock mode
       55    0C A8    9A  03F5  1340          MOVZBL  RSB$B_GGMODE(R8),R5     ; Get group grant mode
14 FC01 CF45    51    E1  03F9  1341          BBC     R1,LCK$COMPAT_TBL[R5],72$ ; Branch if incompatible
                        0400  1342
                        0400  1343          ; Lock can be granted
                        0400  1344
             0208    30  0400  1345          BSBW    LCK$GRANT_LOCK          ; Returns status in R0
             00BD    31  0403  1346          BRW     LCK$SYNC_EXIT
                        0406  1347
                        0406  1348 65$:     ; Skip this lock if it's in a SCS wait state (anything but
                        0406  1349          ; LKB$K_WAITING).
                        0406  1350
          50    60    D0  0406  1351          MOVL    (R0),R0                 ; Point to lock
             FF 8F    91  0409  1352          CMPB    #LKB$K_WAITING,-        ; Is it waiting?
               FE A0        040C  1353                  LKB$B_STATE-LKB$L_SQFL(R0)
```

```
                DC   12   040E  1354          BNEQ    60$                     ; No, skip over it
                                0410  1355
                                0410  1356 70$:    ; Request cannot be granted due to other locks in the waiting
                                0410  1357          ; or conversion queue ahead of us.  If RECOVER bit is set,
                                0410  1358          ; then ignore these waiters and try granting anyway.
                                0410  1359
             DD 59   07   E0    0410  1360          BBS     #LCK$V_RECOVER,R9,62$   ; Branch if recovering a lock
                                0414  1361
                                0414  1362 72$:    ; Request cannot be granted due to other waiters or incompatibility.
                                0414  1363          ; The request gets queued unless the user requested that it not
                                0414  1364          ; be queued if it cannot be granted.
                                0414  1365
             0D 59   02   E0    0414  1366          BBS     #LCK$V_NOQUEUE,R9,80$   ; Br. if request should not be queued
          54 00000000'GF   D0    0418  1367          MOVL    G^SCH$GL_CURPCB,R4      ; Get PCB address
                  03A6   30    041F  1368          BSBW    LCK$QUEUEWAIT           ; Insert lock on wait queue, etc.
                  00D3   31    0422  1369          BRW     LCK$QUEUED_EXIT         ; Exit system service
                                0425  1370
                                0425  1371 80$:    ; Request is not to be queued.  Clean up and return status in R0.
                                0425  1372
             5B 09B8 8F   3C    0425  1373          MOVZWL  #SS$_NOTQUEUED,R11      ; Status
                  00E0   31    042A  1374          BRW     LCK$NOT_QUEUED
                                042D  1375
                                042D  1376 REM_LOCK:
                                042D  1377          ; Send this lock request to another system
                                042D  1378
             00000000'GF   17   042D  1379          JMP     G^LCK$SND_LOCKREQ       ; Send remote lock request
                                0433  1380
                                0433  1381          ; Possible return entry points are:
                                0433  1382          ;
                                0433  1383          ;       LCK$LOCAL_LOCK  Handle request here after all
                                0433  1384          ;       LCK$SYNC_EXIT   Lock request was granted
                                0433  1385          ;       LCK$QUEUED_EXIT Lock request was queued
                                0433  1386          ;       LCK$NOT_QUEUED  Lock request was not queued
```

```
                     0433  1388          .IF NDF LOADSW
                 00000433  1389          .PSECT  LOCKMGR
                     0433  1390          .ENDC
                     0433  1391
                     0433  1392 NEW_RESOURCE:
                     0433  1393          ; Resource does not exist, so create it.  Register usage is:
                     0433  1394          ;
                     0433  1395          ;       R6      Address of LKB
                     0433  1396          ;       R7      Address of parent RSB (or 0 if no parent)
                     0433  1397          ;       R8      Address of RSB being created
                     0433  1398          ;       R9      Flags
                     0433  1399          ;       R11     Address of last RSB in hash chain
                     0433  1400
          36   90   0433  1401 85$:     MOVB    #DYN$C_RSB,-            ; Store type field
        0A A8          0435  1402                  RSB$B_TYPE(R8)
    50 A6   58   D0   0437  1403          MOVL    R8,LKB$L_RSB(R6)        ; Store RSB pointer in LKB
                     043B  1404
                     043B  1405          ; Insert RSB into hash chain.  R11 points to previous entry
                     043B  1406          ; which was, until now, the last one in the chain.
                     043B  1407
       6B   58   D0  043B  1408          MOVL    R8,RSB$L_HSHCHN(R11)    ; Make previous entry point to this one
          68   D4   043E  1409          CLRL    RSB$L_HSHCHN(R8)        ; This one now ends the chain
    04 A8   5B   D0   0440  1410          MOVL    R11,RSB$L_HSHCHNBK(R8)  ; Back pointer points to previous one
                     0444  1411
                     0444  1412          ; Fill in remaining fields in RSB
                     0444  1413
                     0444  1414          ASSUME  RSB$W_REFCNT  EQ  RSB$L_VALSEQNUM+4
                     0444  1415          ASSUME  RSB$W_BLKASTCNT  EQ  RSB$W_REFCNT+2
                     0444  1416          ASSUME  RSB$L_CVTQFL  EQ  RSB$L_GRQFL+8
                     0444  1417          ASSUME  RSB$L_WTQFL  EQ  RSB$L_CVTQFL+8
                     0444  1418          ASSUME  RSB$B_CGMODE  EQ RSB$B_GGMODE+1
                     0444  1419          ASSUME  RSB$W_STATUS  EQ RSB$B_CGMODE+1
                     0444  1420
 50    10 A8   DE   0444  1421          MOVAL   RSB$L_GRQFL(R8),R0      ; Initialize all three queue headers
    51   50   D0   0448  1422          MOVL    R0,R1
    81   50   D0   044B  1423          MOVL    R0,(R1)+                ; Granted queue
    81   80   7E   044E  1424          MOVAQ   (R0)+,(R1)+
    81   50   D0   0451  1425          MOVL    R0,(R1)+                ; Conversion queue
    81   80   7E   0454  1426          MOVAQ   (R0)+,(R1)+
    81   50   D0   0457  1427          MOVL    R0,(R1)+                ; Waiting queue
    61   50   D0   045A  1428          MOVL    R0,(R1)
      28 A8   7C   045D  1429          CLRQ    RSB$Q_VALBLK(R8)        ; Clear value block
      30 A8   7C   0460  1430          CLRQ    RSB$Q_VALBLK+8(R8)
      3C A8   7C   0463  1431          CLRQ    RSB$L_VALSEQNUM(R8)     ; Clear value block sequence number,
                     0466  1432                                          ; sub-RSB reference count and
                     0466  1433                                          ; blocking AST count
      0C A8   D4   0466  1434          CLRL    RSB$B_GGMODE(R8)        ; Clear modes, status
      46 A8   B4   0469  1435          CLRW    RSB$W_RQSEQNM(R8)       ; Clear req. seq. number
                     046C  1436
                     046C  1437          ; If there is a parent RSB then incr. sub-RSB reference count
                     046C  1438          ; and check for maximum depth of resource name tree.
                     046C  1439
          57   D5   046C  1440          TSTL    R7                      ; Is there a parent?
          23   13   046E  1441          BEQL    90$                     ; No parent
 0B A7    01   81   0470  1442          ADDB3   #1,RSB$B_DEPTH(R7),-    ; Our depth is 1 more than our
        0B A8          0474  1443                  RSB$B_DEPTH(R8)         ; parent's depth
      0B A8   91   0476  1444          CMPB    RSB$B_DEPTH(R8),-       ; Is our depth equal to
```

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                00000000'GF        0479  1445                    G^LCK$GB_MAXDEPTH       ; maximum allowed?
                        10   1E    047E  1446            BGEQU   88$                     ; Yes - error
                     40 A7   B6    0480  1447            INCW    RSB$W_REFCNT(R7)        ; Increment parent's sub RSB ref. count
                     38 A7   D0    0483  1448            MOVL    RSB$L_CSID(R7),-        ; Our parent's CSID becomes
                     38 A8         0486  1449                    RSB$L_CSID(R8)          ; ours also
                        2C   13    0488  1450            BEQL    95$                     ; Resource is managed here
                53   38 A8   D0    048A  1451            MOVL    RSB$L_CSID(R8),R3       ; Get CSID of destination system
                        9D   11    048E  1452 87$:       BRB     REM_LOCK                ; Resource is managed by another system
                      0071   31    0490  1453 88$:       BRW     DEPTH_ERROR
                                   0493  1454
                                   0493  1455 90$:       ; This resource has no parent.  Send lock request to appropriate
                                   0493  1456             ; directory system.  If this system is the directory system for this
                                   0493  1457             ; resource, then turn RSB into a directory entry
                                   0493  1458
            53  00000000'GF   D0    0493  1459            MOVL    G^LCK$GL_DIRVEC,R3      ; Get address of directory vector
                        10   13    049A  1460            BEQL    93$                     ; No vector, we are dir. sys.
                51   44 A8   3C    049C  1461            MOVZWL  RSB$W_HASHVAL(R8),R1    ; Get hash value
                        52   D4    04A0  1462            CLRL    R2                      ; Clear high order hash value
        51  50  51   F4 A3   7B    04A2  1463            EDIV    -12(R3),R1,R0,R1        ; Remainder in R1
                     53   6341   D0    04A8  1464            MOVL    (R3)[R1],R3             ; Get directory system CSID
                38 A8   53   D0    04AC  1465 93$:       MOVL    R3,RSB$L_CSID(R8)       ; Store it in RSB
                        DC   12    04B0  1466            BNEQ    87$                     ; Not us - do a directory lookup
                        01   A8    04B2  1467            BISW    #RSB$M_DIRENTRY,-       ; Set directory entry bit
                     0E A8         04B4  1468                    RSB$W_STATUS(R8)
                                   04B6  1469
                51   34 A6   9A    04B6  1470 95$:       MOVZBL  LKB$B_RQMODE(R6),R1     ; Get requested lock mode
                      0153   30    04BA  1471            BSBW    LCK$GRANT_LOCK_ALT      ; Grant lock
                                   04BD  1472
                          00000002 04BD  1473                    .IF NE  CA$_MEASURE
                00000000'GF   D6   04BD  1474                    INCL    G^PMS$GL_ENQNEW_LOC
                                   04C3  1475                    .ENDC
                                   04C3  1476
                                   04C3  1477 LCK$SYNC_EXIT::
                                   04C3  1478             ; The request has been satisfied synchronously.  Status is already
                                   04C3  1479             ; in R0 and LKB$L_LKST1.  Insert the lock onto the head of the
                                   04C3  1480             ; lock list in the PCB (unless it's a system lock) and store
                                   04C3  1481             ; value block, if specified.
                                   04C3  1482             ; Note: Conversions should not use this exit path as they are
                                   04C3  1483             ; already on the PCB's lock list.
                                   04C3  1484
                                   04C3  1485             ASSUME  LCK$V_VALBLK  EQ  0
                                   04C3  1486
                         0C A6   D5    04C3  1487            TSTL    LKB$L_PID(R6)           ; Is this a system owned lock?
                            0D   13    04C6  1488            BEQL    10$                     ; Yes, don't insert onto PCB queue
            54  00000000'GF   D0    04C8  1489            MOVL    G^SCH$GL_CURPCB,R4      ; Get address of PCB
                         40 A6   0E    04CF  1490            INSQUE  LKB$L_OWNQFL(R6),-      ; Insert lock at head of process
                       0104 C4         04D2  1491                    PCB$L_LOCKQFL(R4)       ; lock list
                       23 59   E9      04D5  1492 10$:       BLBC    R9,LCK$NORET_VALBLK     ; Branch if no value block
                                       04D8  1493
                                       04D8  1494 LCK$RET_VALBLK::
                                       04D8  1495             ; Store RSB's value block in caller's value block, store LKSB,
                                       04D8  1496             ; and return.  Status is already in R0 and LKB$L_LKST1.
                                       04D8  1497             ; However, if the value block is marked invalid, then we will change
                                       04D8  1498             ; the status in LKB$L_LKST1 to SS$_VALNOTVALID.
                                       04D8  1499
                                       04D8  1500             SETIPL  #IPL$_ASTDEL            ; Lower IPL to write in caller's
                                       04DB  1501                                             ; address space but still block ASTs
```

```
                02  B3  04DB  1502          BITW    #RSB$M_VALINVLD,-       ; Is value block valid?
             0E AB       04DD  1503                  RSB$W_STATUS(R8)
                06  13  04DF  1504          BEQL    10$                     ; Yes
           09F0 8F   B0  04E1  1505          MOVW    #SS$_VALNOTVALID,-      ; No, change completion status
             2C A6       04E5  1506                  LKB$L_LKST1(R6)
         51    24 A6   D0  04E7  1507 10$:      MOVL    LKB$L_LKSB(R6),R1       ; Get LKSB address
         81    2C A6   7D  04EB  1508          MOVQ    LKB$L_LKST1(R6),(R1)+   ; Store LKSB
         81    28 A8   7D  04EF  1509          MOVQ    RSB$Q_VALBLK(R8),(R1)+  ; Copy RSB value block to caller's
         81    30 A8   7D  04F3  1510          MOVQ    RSB$Q_VALBLK+8(R8),(R1)+; value block
                04  04  04F7  1511          RET                             ; Return
                        04F8  1512
                        04F8  1513
                        04F8  1514
                        04F8  1515 LCK$QUEUED_EXIT::
                        04F8  1516          ; Come here if request was queued.
                        04F8  1517
              50    01  3C  04F8  1518          MOVZWL  S^#SS$_NORMAL,R0        ; Indicate it was queued successfully
                        04FB  1519
                        04FB  1520 LCK$NORET_VALBLK::
                        04FB  1521          ; Exit service with status in R0.  Copy contents of internal
                        04FB  1522          ; LKSB to the caller's LKSB.  Remember, once IPL is lowered to 0
                        04FB  1523          ; the LKB can be instantly deleted out from under us.
                        04FB  1524
                        04FB  1525          SETIPL  #IPL$_ASTDEL            ; Lower IPL to write in caller's
                        04FE  1526                                          ; address space but still block ASTs
             2C A6  7D  04FE  1527          MOVQ    LKB$L_LKST1(R6),-       ; Store contents of LKSB
             24 B6      0501  1528                  @LKB$L_LKSB(R6)
                04  0503  1529          RET                             ; Return
                        0504  1530
```

```
                        .SBTTL  Error Handling for $ENQ

;++
; FUNCTIONAL DESCRIPTION:
;
;       This routine performs the error handling for the $ENQ system
;       service.  This routine has a number of entry points, depending
;       on what the error is.  Each error entry point backs up the
;       operations performed thus far.  Consequently, the order of operations
;       in this routine must be exactly the reverse of the order of
;       operations in the $ENQ system service.
;
; CALLING SEQUENCE:
;
;       Branch to error entry point.  This routine returns from the system
;       service.  The entry points named CLEANUPx are called with a BSBW
;       and they return to the caller.  Then the appropriate ERROR_EXIT
;       may be branched to.
;
; INPUT PARAMETERS:
;
;       R0      Completion code (some entry points)
;       R6      Address of LKB (some entry points)
;       R8      Address of RSB (some entry points)
;       R11     Completion code (some entry points)
;               Address of previous RSB (DEPTH_ERROR entry point only)
;
; OUTPUT PARAMETERS:
;
;       R0      Status code
;
; COMPLETION CODES:
;
;       SS$_ACCVIO              Access violation (on LKSB or resource name)
;       SS$_BADPARAM            Bad lock mode
;       SS$_IVLOCKID            Invalid lock id
;       SS$_CVTUNGRANT          Attempted to convert an ungranted lock
;       SS$_PARNOTGRANT         Parent lock not granted
;       SS$_NOSYSLCK            No SYSLCK privilege (needed for a system lock)
;       SS$_IVBUFLEN            Resource name length = 0 or > 31
;       SS$_INSFMEM             Insufficient dynamic memory
;       SS$_EXASTLM             Exceeded AST quota
;       SS$_EXENQLM             Exceeded enqueue quota
;       SS$_NOTQUEUED           Request was not queued
;       SS$_EXDEPTH             Exceeded allowed depth of resource name tree
;
; SIDE EFFECTS:
;
;       None
;--

                        .IF NDF LOADSW
00000504                .PSECT  LOCKMGR
                        .ENDC

                        .ENABL  LSB
```

```
                                0504  1589 DEPTH_ERROR:
                                0504  1590         ; Remove RSB from hash chain and deallocate both LKB (R6)
                                0504  1591         ; and RSB (R8).  R11 points to previous RSB in hash chain.
                                0504  1592
                          6B    D4  0504  1593         CLRL    RSB$L_HSHCHN(R11)       ; End hash chain one RSB earlier
                    5B    0E1A 8F   3C  0506  1594         MOVZWL  #SS$_EXDEPTH,R11        ; Store status
                          08    11  0508  1595         BRB     10$
                                050D  1596
                                050D  1597 LCK$NOT_QUEUED::
                                050D  1598         ; Deallocate lock id.  LKB address in R6, status in R11.
                                050D  1599
                    00000002    050D  1600         .IF NE  CA$_MEASURE
                00000000'GF     D6  050D  1601         INCL    G^PMS$GL_ENQNOTQD
                                0513  1602         .ENDC
                                0513  1603
                          58    D4  0513  1604         CLRL    R8                      ; Indicates no RSB to deallocate
                                0515  1605
                     50   30 A6   3C  0515  1606 10$:    MOVZWL  LKB$L_LKID(R6),R0       ; Get lock id index
                51   00000000'GF   D0  0519  1607         MOVL    G^LCK$GL_IDTBL,R1       ; *** Combine with next instr.
                       51   6140  DE  0520  1608         MOVAL   (R1)[R0],R1             ; Point to table entry
                61   00000000'GF   B0  0524  1609         MOVW    G^LCK$GL_NXTID,(R1)     ; Store next id in this id's slot
            02 A1    32 A6   01    A1  052B  1610         ADDW3   #1,LKB$L_LKID+2(R6),2(R1) ; Incr. and store sequence number
                          04    1C  0531  1611         BVC     20$                     ; Didn't overflow to a system address
                02 A1     01    B0  0533  1612         MOVW    #1,2(R1)                ; Overflowed - restart seq. number at 1
            00000000'GF   50    D0  0537  1613 20$:    MOVL    R0,G^LCK$GL_NXTID       ; This id becomes the next one
                          24    10  053E  1614         BSBB    CLEANUP1                ; Cleanup (puts PCB address in R4)
                                0540  1615
                                0540  1616 ERROR_EXIT_R11:
                    50    5B    D0  0540  1617         MOVL    R11,R0                  ; Move status to R0
                                0543  1618
                                0543  1619 ERROR_EXIT_R0:
                                0543  1620         ; Everything has been cleaned up; status is in R0.  Set event flag
                                0543  1621         ; and exit.
                                0543  1622
                                0543  1623         SETIPL  #IPL$_ASTDEL            ; Lower IPL
                          50    DD  0546  1624         PUSHL   R0                      ; Save status
                54   00000000'GF   D0  0548  1625         MOVL    G^SCH$GL_CURPCB,R4      ; Get PCB address
                     51   60 A4   D0  054F  1626         MOVL    PCB$L_PID(R4),R1        ; Get PID
                          52    02    3C  0553  1627         MOVZWL  #PRI$_RESAVL,R2         ; Get priority increment class
                     53   04 AC   9A  0556  1628         MOVZBL  EFN(AP),R3              ; Get event flag
                00000000'GF     16  055A  1629         JSB     G^SCH$POSTEF            ; Set event flag
                          50 8ED0   0560  1630         POPL    R0                      ; Restore status
                                04  0563  1631         RET
                                0564  1632
                                0564  1633
                                0564  1634 ; Cleanup subroutine.  This subroutine has various entry points which
                                0564  1635 ; are called depending on how much cleanup is required.
                                0564  1636 ;
                                0564  1637 ; Inputs:
                                0564  1638 ;
                                0564  1639 ;       R6      Address of LKB
                                0564  1640 ;       R8      Address of RSB or 0 to indicate no RSB
                                0564  1641 ;
                                0564  1642 ; Outputs:
                                0564  1643 ;
                                0564  1644 ;       R4      Address of PCB (CLEANUP1 entry point only)
                                0564  1645
```

```
                        0564  1646 CLEANUP1:
                        0564  1647         ; Increment enqueue count (if it was charged)
                        0564  1648
54  00000000'GF   D0    0564  1649         MOVL    G^SCH$GL_CURPCB,R4      ; Get PCB address
                  05    056B  1650         BBS     #LKB$V_NOQUOTA,-        ; Branch if no quota was charged
                08 2A A6  056D  1651                 LKB$W_STATUS(R6),CLEANUP2
50    0080 C4   D0    0570  1652         MOVL    PCB$L_JIB(R4),R0        ; Get address of JIB
                4C A0   B6    0575  1653         INCW    JIB$W_ENQCNT(R0)        ; Increment enqueue count
                        0578  1654
                        0578  1655 CLEANUP2:
                        0578  1656         ; Decrement parent LKB's sub LKB reference count.
                        0578  1657
50    48 A6     D0    0578  1658         MOVL    LKB$L_PARENT(R6),R0     ; Get parent LKB address
                  05    057C  1659         BEQL    CLEANUP3                ; No parent
                4C A0   B7    057E  1660         DECW    LKB$W_REFCNT(R0)        ; Decrement parent's sub LKB ref. count
                  15    0581  1661         BLSS    90$                     ; Ref. count went negative
                        0583  1662
                        0583  1663 CLEANUP3:
                        0583  1664         ; Deallocate RSB.   R8 contains RSB address or
                        0583  1665         ; 0 indicating no RSB to deallocate, R11 contains status.
                        0583  1666
50    58        D0    0583  1667         MOVL    R8,R0                   ; Address of RSB
                  06    0586  1668         BEQL    CLEANUP4                ; No RSB
00000000'GF       16    0588  1669         JSB     G^EXE$DEANONPAGED       ; Deallocate it
                        058E  1670
                        058E  1671 CLEANUP4:
                        058E  1672         ; Deallocate LKB.  R6 contains LKB address.
                        058E  1673
50    56        D0    058E  1674         MOVL    R6,R0                   ; Address of LKB
00000000'GF       16    0591  1675         JSB     G^EXE$DEANONPAGED       ; Deallocate it
                  05    0597  1676         RSB
                        0598  1677
                        0598  1678 90$:    BUG_CHECK       LKBREFNEG,FATAL
                        059C  1679         .DSABL  LSB
```

```
059C  1681          .SBTTL  LCK$HASH_SEARCH - Hash resource and search hash table
059C  1682
059C  1683 ;++
059C  1684 ; FUNCTIONAL DESCRIPTION:
059C  1685 ;
059C  1686 ;       This routine hashes the resource name and parent RSB address
059C  1687 ;       and then searches the hash table looking for a RSB with
059C  1688 ;       matching:
059C  1689 ;               o  resource names
059C  1690 ;               o  parent RSB addresses
059C  1691 ;               o  access modes
059C  1692 ;               o  name spaces (system or group)
059C  1693 ;               o  group numbers
059C  1694 ;       Resource name length, access mode, name space and group number
059C  1695 ;       are all collected into one longword to make the comparison easier.
059C  1696 ;
059C  1697 ;       The entry point LCK$SRCH_HSHTBL just searches the table using
059C  1698 ;       a supplied hash value.
059C  1699 ;
059C  1700 ; CALLING SEQUENCE:
059C  1701 ;
059C  1702 ;       BSBW    LCK$HASH_SEARCH         (Hash resource and search table)
059C  1703 ;       BSBW    LCK$SRCH_HSHTBL         (Just search hash table)
059C  1704 ;       (Note: IPL must be at IPL$_SYNCH)
059C  1705 ;
059C  1706 ; INPUT PARAMETERS:
059C  1707 ;
059C  1708 ;       R1      Hash value in low-order 16 bits (LCK$SRCH_HSHTBL only)
059C  1709 ;               High order 16 bits must be zero
059C  1710 ;       R4      Address of parent RSB field (see following ASSUMEs)
059C  1711 ;       R10     Length of resource name + 8
059C  1712 ;
059C  1713 ; IMPLICIT INPUTS:
059C  1714 ;
059C  1715 ;       This resource's parent's hash value is used to compute this hash
059C  1716 ;       value.
059C  1717 ;
059C  1718 ; OUTPUT PARAMETERS:
059C  1719 ;
059C  1720 ;       R0      0 if match found
059C  1721 ;               1 if no match found
059C  1722 ;       R5      Address of matching RSB if a match was found
059C  1723 ;       R11     Address of last entry in hash chain if no match found
059C  1724 ;
059C  1725 ; IMPLICIT OUTPUTS:
059C  1726 ;
059C  1727 ;       RSB$W_HASHVAL is stored with the hash value for this resource
059C  1728 ;       (LCK$HASH_SEARCH entry only)
059C  1729 ;
059C  1730 ; SIDE EFFECTS:
059C  1731 ;
059C  1732 ;       R0 - R3 destroyed
059C  1733 ;
059C  1734 ; NOTES:
059C  1735 ;
059C  1736 ;       This routine depends on the following fields being adjacent
059C  1737 ;       in the RSB.
```

```
                                                     H 1
                                059C  1738 ;--
                                059C  1739
                                059C  1740          ASSUME  RSB$W_GROUP  EQ  RSB$L_PARENT+4
                                059C  1741          ASSUME  RSB$B_RMOD  EQ  RSB$W_GROUP+2
                                059C  1742          ASSUME  RSB$B_RSNLEN  EQ  RSB$B_RMOD+1
                                059C  1743          ASSUME  RSB$T_RESNAM  EQ  RSB$B_RSNLEN+1
                                059C  1744
                                059C  1745          .IF NDF LOADSW
                              0000059C  1746          .PSECT  LOCKMGR
                                059C  1747          .ENDC
                                059C  1748
                                059C  1749 LCK$HASH_SEARCH::
                                059C  1750
                                059C  1751          ; Zero pad resource name to a longword boundary and get # of
                                059C  1752          ; longwords in resource name plus parent RSB, group, etc.
                                059C  1753
          53    5A    FE 8F    78  059C  1754          ASHL    #-2,R10,R3              ; Divide size by 4
                            53    D7  05A1  1755          DECL    R3                      ; Account for parent address
     50   5A   FFFFFFFC 8F    CB  05A3  1756          BICL3   #^C<3>,R10,R0           ; Get remainder from 4
                             0C   13  05AB  1757          BEQL    40$                     ; Branch if multiple of 4
                      51   644A   9E  05AD  1758          MOVAB   (R4)[R10],R1            ; Get address of end of name
                            81    94  05B1  1759 30$:     CLRB    (R1)+                   ; Clear to next longword boundary
                    FA 50    04   F2  05B3  1760          AOBLSS  #4,R0,30$
                            53    D6  05B7  1761          INCL    R3                      ; R3 = # of longwords in name
                                05B9  1762
                                05B9  1763          ; Fold resource name and auxilary fields into a single
                                05B9  1764          ; longword.  R3 = number of longwords to combine.
                                05B9  1765
                      51    04 A4   DE  05B9  1766 40$:     MOVAL   4(R4),R1                ; Pointer to GROUP field
                            52    D4  05BD  1767          CLRL    R2                      ; Initialize result reg.
                         52   81    CC  05BF  1768 45$:     XORL    (R1)+,R2                ; XOR next longword
                    52   52   09    9C  05C2  1769          ROTL    #9,R2,R2                ; and rotate
                            F6 53    F5  05C6  1770          SOBGTR  R3,45$                  ; Repeat
                         50   64    D0  05C9  1771          MOVL    (R4),R0                 ; Get address of parent RSB
                             04   13  05CC  1772          BEQL    50$                     ; No parent
                      52    44 A0   AC  05CE  1773          XORW    RSB$W_HASHVAL(R0),R2    ; XOR parent's hash value
          52   A53F19B7 8F    C4  05D2  1774 50$:     MULL    #^XA53F19B7,R2          ; Multiply by unusual number
                    52   52   10    9C  05D9  1775          ROTL    #16,R2,R2               ; Swap words
                                05DD  1776
                                05DD  1777          ; Have composite resource name and parent hash value in
                                05DD  1778          ; the low order word of R2.  Store it in the RSB and then
                                05DD  1779          ; convert it to a hash table entry address (in R5).
                                05DD  1780
                      FC A4     52    B0  05DD  1781          MOVW    R2,RSB$W_HASHVAL-RSB$L_PARENT(R4)  ; Store hash value
                            51    52    3C  05E1  1782          MOVZWL  R2,R1                   ; Clear high word and move to R1
                                05E4  1783
                                05E4  1784 LCK$SRCH_HSHTBL::
                                05E4  1785          ; Hash value is in low word of R1.  High word must be zero.
                                05E4  1786
     51   51    00000000'GF     78  05E4  1787          ASHL    G^LCK$GB_HTBLSHFT,R1,R1 ; Shift to get hash table index
          50    00000000'GF     D0  05EC  1788          MOVL    G^LCK$GL_HASHTBL,R0     ; *** Combine with next instr.
                  55    6041    DE  05F3  1789          MOVAL   (R0)[R1],R5             ; Get address of hash table entry
                                05F7  1790
                                05F7  1791          ; R5 = hash table entry address.  Search hash table looking for
                                05F7  1792          ; a resource block with a matching resource name, parent RSB,
                                05F7  1793          ; access mode, name space (system or group), and group number.
                                05F7  1794
```

```
                                                     I 1
                        05F7  1795              ASSUME  RSB$L_HSHCHN  EQ  0
                        05F7  1796
                  5B    55    D0  05F7  1797 60$:     MOVL    R5,R11                      ; R11 will point to previous entry and
                  55    65    D0  05FA  1798          MOVL    (R5),R5                     ; R5 will point to next RSB in hash chain
                        08    13  05FD  1799          BEQL    90$                         ; End of chain - resource not found
              64  48  A5    5A  29  05FF  1800          CMPC3   R10,RSB$L_PARENT(R5),(R4) ; Are the names the same?
                        F1    12  0604  1801          BNEQ    60$                         ; No, but keep looking
                              05  0606  1802          RSB                                 ; Yes, found a match; R0 = 0 from CMPC3
                                  0607  1803
                  50    01    D0  0607  1804 90$:     MOVL    #1,R0                       ; No match found
                              05  060A  1805          RSB
```

```
0608  1807          .SBTTL  LCK$GRANT_LOCK - Grant a lock request
0608  1808
0608  1809 ;++
0608  1810 ; FUNCTIONAL DESCRIPTION:
0608  1811 ;
0608  1812 ;       This routine performs the actual granting of a lock.  This includes:
0608  1813 ;               o  Computing the new group grant mode
0608  1814 ;               o  Inserting the LKB on the granted queue
0608  1815 ;               o  Setting the event flag (if required)
0608  1816 ;               o  Delivering the completion AST (if required)
0608  1817 ;               o  Delivering the blocking AST (if required)
0608  1818 ;
0608  1819 ;       This routine gets called for both synchronous grants (in the context
0608  1820 ;       of the process requesting a lock) and asynchronous grants (in the
0608  1821 ;       context of another process that has just performed a dequeue or
0608  1822 ;       a conversion to a lower lock mode).
0608  1823 ;
0608  1824 ;       The alternate entry point LCK$GRANT_LOCK_ALT is used when the caller
0608  1825 ;       knows that there are no granted locks (or waiting conversions) for
0608  1826 ;       this resource.
0608  1827 ;
0608  1828 ;       The entry point LCK$REGRANTLOCK  is used to regrant an attempted
0608  1829 ;       conversion that was put on the conversion queue and then taken
0608  1830 ;       off due to deadlock.  Note that in this case the LKB$M_ASYNC
0608  1831 ;       bit must be set (even though we might be completing the request
0608  1832 ;       synchronously) in order to execute the code that moves the lock from
0608  1833 ;       the tail to the head of the PCB lock queue.
0608  1834 ;
0608  1835 ;       The QUEUE_AST entry point is used to just queue an AST when
0608  1836 ;       dequeuing an ungranted lock (abort or deadlock).
0608  1837 ;
0608  1838 ; CALLING SEQUENCE:
0608  1839 ;
0608  1840 ;       BSBW    LCK$GRANT_LOCK
0608  1841 ;       Note:  IPL must be at IPL$_SYNCH
0608  1842 ;
0608  1843 ; INPUT PARAMETERS:
0608  1844 ;
0608  1845 ;       All entry points:
0608  1846 ;
0608  1847 ;               R1      Lock mode to grant
0608  1848 ;               R6      Address of LKB
0608  1849 ;               R8      Address of RSB
0608  1850 ;
0608  1851 ;       LCK$GRANT_LOCK:
0608  1852 ;
0608  1853 ;               R5      Existing group grant mode
0608  1854 ;
0608  1855 ; IMPLICIT INPUTS:
0608  1856 ;
0608  1857 ;       LCK$REGRANTLOCK and QUEUE_AST:
0608  1858 ;
0608  1859 ;               LKB$L_LKST1 contains final completion status
0608  1860 ;               Also the LKB$M_ASYNC bit must be set
0608  1861 ;
0608  1862 ; OUTPUT PARAMETERS:
0608  1863 ;
```

```
                                                K 1
                     060B  1864 ;       LCK$GRANT_LOCK and LCK$GRANT_LOCK_ALT:
                     060B  1865 ;
                     060B  1866 ;               R0      Request completion code
                     060B  1867 ;               R5      New group grant mode
                     060B  1868 ;
                     060B  1869 ; IMPLICIT OUTPUTS:
                     060B  1870 ;
                     060B  1871 ;       LCK$GRANT_LOCK and LCK$GRANT_LOCK_ALT:
                     060B  1872 ;
                     060B  1873 ;               SS$_NORMAL is stored in the 1st longword of the LKSB
                     060B  1874 ;
                     060B  1875 ; COMPLETION CODES:
                     060B  1876 ;
                     060B  1877 ;       SS$_SYNCH               Synchronous completion
                     060B  1878 ;       SS$_NORMAL              Normal completion
                     060B  1879 ;
                     060B  1880 ; SIDE EFFECTS:
                     060B  1881 ;
                     060B  1882 ;       R1 - R4 are destroyed
                     060B  1883 ;--
                     060B  1884
                     060B  1885          .IF NDF LOADSW
                00000060B  1886          .PSECT  LOCKMGR
                     060B  1887          .ENDC
                     060B  1888
                     060B  1889          .ENABLE LSB
                     060B  1890
                     060B  1891 LCK$GRANT_LOCK::
          55   51   91  060B  1892          CMPB    R1,R5                   ; Should there be a new group grant mode?
               08   1B  060E  1893          BLEQU   10$                     ; No
                     0610  1894
                     0610  1895 LCK$GRANT_LOCK_ALT::
    0C A8   51   90  0610  1896          MOVB    R1,RSB$B_GGMODE(R8)     ; Yes, store group grant mode
       55   51   D0  0614  1897          MOVL    R1,R5                   ; and in R5
    0D A8   51   90  0617  1898          MOVB    R1,RSB$B_CGMODE(R8)     ; Store conversion grant mode
                     061B  1899
    35 A6   51   90  061B  1900 10$:     MOVB    R1,LKB$B_GRMODE(R6)     ; Store granted lock mode
            01   3C  061F  1901          MOVZWL  S^#SS$_NORMAL,-         ; Store success in LKSB
          2C A6        0621  1902          LKB$L_LKST1(R6)
                     0623  1903 LCK$REGRANTLOCK::
                     0623  1904
                     0623  1905          ; Determine if this request wants a blocking AST.  If yes,
                     0623  1906          ; then increment blocking AST count in RSB and determine if we
                     0623  1907          ; are blocking anyone.
                     0623  1908
                     0623  1909          ASSUME  RSB$L_WTQFL  EQ  RSB$L_CVTQFL+8
                     0623  1910
          20 A6    D5  0623  1911          TSTL    LKB$L_BLKASTADR(R6)     ; Blocking AST address specified?
             35    13  0626  1912          BEQL    30$                     ; No
          42 A8    B6  0628  1913          INCW    RSB$W_BLKASTCNT(R8)     ; Incr. blocking AST count
    52    18 A8    DE  062B  1914          MOVAL   RSB$L_CVTQFL(R8),R2     ; Get address of conversion queue
       50    02    D0  062F  1915          MOVL    #2,R0                   ; Do this loop twice
                     0632  1916
       53    52    D0  0632  1917 15$:     MOVL    R2,R3                   ; Save address of queue header
       53    63    D0  0635  1918 20$:     MOVL    (R3),R3                 ; Get address of next element
       53    52    D1  0638  1919          CMPL    R2,R3                   ; Is it the header?
             1A    13  063B  1920          BEQL    25$                     ; Yes, done with this queue
```

```
                54    FC A3    9A  063D  1921          MOVZBL  LKB$B_RQMODE-LKB$L_SQFL(R3),R4  ; No, get requested lock mode
      ED F9B9 CF44     51    E0  0641  1922          BBS     R1,LCK$COMPAT_TBL[R4],20$ ; Br. if compatible
              2A A6     0A    A8  0648  1923          BISW    #LKB$M_BLKASTQED!-      ; Set blocking AST queued and
                                  064C  1924                  LKB$M_DBLKAST,LKB$W_STATUS(R6) ; deliver blocking AST status
                        10    88  064C  1925          BISB    #LKB$M_PKAST,-          ; Set piggyback kernel AST bit
                     0B A6        064E  1926                  LKB$B_RMOD(R6)
                     20 A6    D0  0650  1927          MOVL    LKB$L_BLKASTADR(R6),-   ; Store address of blocking AST routine
                     10 A6        0653  1928                  LKB$L_AST(R6)
                        06    11  0655  1929          BRB     30$                     ; Search no more
                   52   08    C0  0657  1930  25$:    ADDL    #8,R2                   ; Advance to wait queue
                     D5 50    F5  065A  1931          SOBGTR  R0,15$                  ; Repeat
                                  065D  1932
                                  065D  1933  LCK$GRANT_REM::
                                  065D  1934  30$:     ; Set state to granted and insert on granted queue.
                                  065D  1935          ; Determine if a completion AST should be queued.
                                  065D  1936
                     38 A6    0E  065D  1937          INSQUE  LKB$L_SQFL(R6),-        ; Insert lock on granted queue
                     10 A8        0660  1938                  RSB$L_GRQFL(R8)
                        01    90  0662  1939          MOVB    #LKB$K_GRANTED,-        ; Indicate lock is on granted queue
                     36 A6        0664  1940                  LKB$B_STATE(R6)
                                  0666  1941
                50   0689 8F    3C  0666  1942          MOVZWL  #SS$_SYNCH,R0           ; Assume synchronous completion
                        10    B3  066B  1943          BITW    #LKB$M_MSTCPY,-         ; Branch if this a
                     2A A6        066D  1944                  LKB$W_STATUS(R6)        ; master copy
                        13    12  066F  1945          BNEQ    35$
                        04    B3  0671  1946          BITW    #LKB$M_ASYNC,-          ; Branch if this request is being
                     2A A6        0673  1947                  LKB$W_STATUS(R6)        ; completed asynchronously
                        1F    12  0675  1948          BNEQ    40$
                        08    B3  0677  1949          BITW    #LCK$M_SYNCSTS,-        ; Branch if SYNCSTS bit is set
                     28 A6        0679  1950                  LKB$W_FLAGS(R6)
                        66    12  067B  1951          BNEQ    80$
                                  067D  1952
                     1C A6    D5  067D  1953          TSTL    LKB$L_CPLASTADR(R6)     ; Did caller specify a completion AST?
                        4D    13  0680  1954          BEQL    70$                     ; No, just set event flag
                        3E    11  0682  1955          BRB     50$                     ; Yes, set appropriate bits
                                  0684  1956
                                  0684  1957  35$:     ; Come here if the lock is a master copy
                                  0684  1958
                        04    B3  0684  1959          BITW    #LKB$M_ASYNC,-          ; Branch if this request is being
                     2A A6        0686  1960                  LKB$W_STATUS(R6)        ; completed synchronously
                        0B    13  0688  1961          BEQL    37$
                        55    DD  068A  1962          PUSHL   R5                      ; Save group grant mode
              00000000'GF     16  068C  1963          JSB     G^LCK$SND_GRANTED       ; Send a granted message
                        55 8ED0   0692  1964          POPL    R5                      ; Restore it
                           05     0695  1965  37$:     RSB
                                  0696  1966
                                  0696  1967  40$:     ; The request is being completed asynchronously so it is necessary
                                  0696  1968          ; to remove the lock from its current position in the PCB queue
                                  0696  1969          ; (around the tail) and reinsert it at the head of the PCB queue.
                                  0696  1970
                54    0C A6    3C  0696  1971          MOVZWL  LKB$L_PID(R6),R4        ; Get process index
           50   00000000'GF     D0  069A  1972          MOVL    G^SCH$GL_PCBVEC,R0      ; *** Combine this and next inst. when
                                  06A1  1973                                          ;  PIC code is no longer needed ***
                  54    6044    D0  06A1  1974          MOVL    (R0)[R4],R4             ; Convert to PCB address
                  50    40 A6   0F  06A5  1975          REMQUE  LKB$L_OWNQFL(R6),R0     ; Remove lock from PCB lock queue
              0104 C4     60    0E  06A9  1976          INSQUE  (R0),PCB$L_LOCKQFL(R4)  ; Insert at head of lock queue
                                  06AE  1977
```

```
                                    ;  1
                     06AE  1978 QUEUE_AST:
                     06AE  1979         ; Request is being completed asynchronously so a kernel AST is
                     06AE  1980         ; required to store status.  This is also used as an entry point
                     06AE  1981         ; to queue an AST when dequeuing an ungranted lock.  (e.g. abort
                     06AE  1982         ; or deadlock).  Status should already be in LKB$L_LKST1.  Note:
                     06AE  1983         ; The LKB$M_NODELETE bit may have been cleared before calling QUEUE_AST.
                     06AE  1984
          06   E5   06AE  1985         BBCC    #LKB$V_TIMOUTQ,-        ; Remove lock from timeout queue
 03 2A A6              06B0  1986                 LKB$W_STATUS(R6),45$    ; if it was on it
       50   66   0F   06B3  1987         REMQUE  LKB$L_ASTQFL(R6),R0
    1C A6   D5   06B6  1988 45$:        TSTL    LKB$L_CPLASTADR(R6)     ; Did caller specify a completion AST?
          07   12   06B9  1989         BNEQ    50$                     ; Yes
    80 8F   88   06BB  1990         BISB    #LKB$M_KAST,-           ; No, set special kernel AST bit
    0B A6              06BE  1991                 LKB$B_RMOD(R6)
          09   11   06C0  1992         BRB     60$                     ; and deliver completion AST anyway
                     06C2  1993
                     06C2  1994 50$:     ; A completion AST was requested by the caller.
                     06C2  1995
          10   88   06C2  1996         BISB    #LKB$M_PKAST,-          ; Set piggyback kernel AST flag
    0B A6              06C4  1997                 LKB$B_RMOD(R6)
    1C A6   D0   06C6  1998         MOVL    LKB$L_CPLASTADR(R6),-   ; Store completion AST address
    10 A6              06C9  1999                 LKB$L_AST(R6)
          01   A8   06CB  2000 60$:        BISW    #LKB$M_DCPLAST,-        ; Set deliver completion AST flag
    2A A6              06CD  2001                 LKB$W_STATUS(R6)
                     06CF  2002
                     06CF  2003 70$:     ; Set the event flag
                     06CF  2004
 51    0C A6   D0   06CF  2005         MOVL    LKB$L_PID(R6),R1        ; Get PID
    52    02   9A   06D3  2006         MOVZBL  #PRI$_RESAVL,R2         ; Priority increment class
 53    37 A6   9A   06D6  2007         MOVZBL  LKB$B_EFN(R6),R3        ; Event flag number
00000000'GF   16   06DA  2008         JSB     G^SCH$POSTEF            ; Post event flag
    50    01   3C   06E0  2009         MOVZWL  S^#SS$_NORMAL,R0        ; Return success
                     06E3  2010
                     06E3  2011 80$:     ; Queue AST if either completion or blocking AST flags are set.
                     06E3  2012
 2A A6    03   B3   06E3  2013         BITW    #LKB$M_DCPLAST!-        ; Is either flag set?
                     06E7  2014                 LKB$M_DBLKAST,LKB$W_STATUS(R6)
          1A   13   06E7  2015         BEQL    90$                     ; No
          21   BB   06E9  2016         PUSHR   #^M<R0,R5>              ; Save R0 and R5
    55    56   D0   06EB  2017         MOVL    R6,R5                   ; R5 points to ACB
       0C A6   D5   06EE  2018         TSTL    LKB$L_PID(R6)           ; Is this a system owned lock?
          11   13   06F1  2019         BEQL    95$                     ; Yes
       0A'AF   9E   06F3  2020         MOVAB   B^LOCK_KAST,-           ; Store address of kernel AST routine
       18 A6              06F6  2021                 LKB$L_KAST(R6)
    52    02   9A   06F8  2022         MOVZBL  #PRI$_RESAVL,R2         ; Priority increment class
00000000'GF   16   06FB  2023         JSB     G^SCH$QAST              ; Yes, queue AST
          21   BA   0701  2024         POPR    #^M<R0,R5>              ; Restore regs
          05   0703  2025 90$:        RSB
                     0704  2026
                     0704  2027 95$:     ; Handle system owned locks.  Since we can't be delivering a
                     0704  2028         ; completion AST, we must have to deliver a blocking AST
                     0704  2029         ; (actually a blocking subroutine call).
                     0704  2030
       0198   30   0704  2031         BSBW    CALL_BLK_SUBR           ; Call blocking subroutine
          21   BA   0707  2032         POPR    #^M<R0,R5>              ; Restore regs
          05   0709  2033         RSB
                     070A  2034
```

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                070A  2035          .DSABL  LSB
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                                                B 2
                        070A  2037          .SBTTL  LOCK_KAST - Kernel AST routine
                        070A  2038
                        070A  2039 ;++
                        070A  2040 ; FUNCTIONAL DESCRIPTION:
                        070A  2041 ;
                        070A  2042 ;       This routine is the special kernel AST routine.  It is called
                        070A  2043 ;       whenever completion or blocking ASTs are delivered.
                        070A  2044 ;       If a completion AST is being delivered and the request is being
                        070A  2045 ;       completed asynchronously, then the lock status block and
                        070A  2046 ;       optionally the value block are copied to the caller's LKSB.
                        070A  2047 ;       Then (synch. or async.) we see if a blocking AST is required.
                        070A  2048 ;       If it is then we requeue the LKB to deliver the blocking AST.
                        070A  2049 ;       If a blocking AST is being delivered then we just have to clear
                        070A  2050 ;       the bit that tells us to deliver a blocking AST.  Finally, if the
                        070A  2051 ;       LKB is not requeued for an AST we check to see if it should be
                        070A  2052 ;       deleted and if so, delete it.
                        070A  2053 ;
                        070A  2054 ; CALLING SEQUENCE:
                        070A  2055 ;
                        070A  2056 ;       JSB     LOCK_KAST (actually called by SCH$ASTDEL)
                        070A  2057 ;       Note:  This routine may be called as either a special kernel
                        070A  2058 ;       AST routine or piggyback kernel AST routine or both.
                        070A  2059 ;
                        070A  2060 ; INPUT PARAMETERS:
                        070A  2061 ;
                        070A  2062 ;       R4      Address of PCB
                        070A  2063 ;       R5      Address of LKB
                        070A  2064 ;       Note:  Only offsets up to LKB$K_ACBLEN may be used
                        070A  2065 ;
                        070A  2066 ; OUTPUT PARAMETERS:
                        070A  2067 ;
                        070A  2068 ;       None
                        070A  2069 ;
                        070A  2070 ; SIDE EFFECTS:
                        070A  2071 ;
                        070A  2072 ;       ???
                        070A  2073 ;--
                        070A  2074
                        070A  2075          .IF NDF LOADSW
                  00000070A  2076          .PSECT  LOCKMGR
                        070A  2077          .ENDC
                        070A  2078
                        070A  2079 LOCK_KAST:
                     00 E1  070A  2080          BBC     #LKB$V_DCPLAST,-        ; Branch if no completion AST to deliver
                 79 2A A5   070C  2081                  LKB$W_STATUS(R5),40$
                     02 E1  070F  2082          BBC     #LKB$V_ASYNC,-          ; Branch if synchronous completion
                 39 2A A5   0711  2083                  LKB$W_STATUS(R5),20$
                            0714  2084
                            0714  2085          ; Store status and value block, if requested.  If the value block
                            0714  2086          ; is invalid then the status in LKB$L_LKST1 is changed.  Note that
                            0714  2087          ; this only happens if the status code was a success code.
                            0714  2088
               51   24 A5   D0  0714  2089          MOVL    LKB$L_LKSB(R5),R1       ; Get address of LKSB
                     00 E1  0718  2090          BBC     #LCK$V_VALBLK,-         ; Branch if no value block
                 26 28 A5   071A  2091                  LKB$W_FLAGS(R5),10$
                 22 2C A5   E9  071D  2092          BLBC    LKB$L_LKST1(R5),10$     ; Only store value block if request
                            0721  2093                                          ; was successful
```

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                        0721  2094          IFNOWRT #24,(R1),20$            ; Branch if LKSB is not writeable
          50   50 A5   D0   0727  2095          MOVL    LKB$L_RSB(R5),R0        ; R0 = address of RSB
               02   B3   072B  2096          BITW    #RSB$M_VALINVLD,-       ; Is value block valid?
              0E A0         072D  2097                  RSB$W_STATUS(R0)
               06   13   072F  2098          BEQL    5$                      ; Yes
            09F0 8F   B0   0731  2099          MOVW    #SS$_VALNOTVALID,-      ; No, change completion status
              2C A5         0735  2100                  LKB$L_LKST1(R5)
    08 A1     28 A0   7D   0737  2101  5$:     MOVQ    RSB$Q_VALBLK(R0),8(R1)  ; Store value block - Note:  the fact
    10 A1     30 A0   7D   073C  2102          MOVQ    RSB$Q_VALBLK+8(R0),16(R1) ; that we always store the value block
                        0741  2103                                          ; is based on the assumption that $ENQs
                        0741  2104                                          ; that fetch it are always synchronous.
               06   11   0741  2105          BRB     15$
                        0743  2106  10$:     IFNOWRT #8,(R1),20$             ; Branch if LKSB is not writeable
          61   2C A5   D0   0749  2107  15$:     MOVL    LKB$L_LKST1(R5),(R1)    ; Store status
                        074D  2108
                        074D  2109  20$:     ; Requeue LKB if we have to deliver a blocking AST.  Also, convert
                        074D  2110           ; lock back to system owned, if necessary.
                        074D  2111
                        074D  2112          SETIPL  #IPL$_SYNCH             ; Raise IPL
               01   AA   0750  2113          BICW    #LKB$M_DCPLAST,-        ; Clear deliver completion AST bit
              2A A5         0752  2114                  LKB$W_STATUS(R5)
               08   E0   0754  2115          BBS     #LKB$V_CVTTOSYS,-       ; Branch if this lock should be con-
            15 2A A5         0756  2116                  LKB$W_STATUS(R5),30$    ; verted back to system owned
               01   E1   0759  2117          BBC     #LKB$V_DBLKAST,-        ; Branch if no blocking AST to deliver
            31 2A A5         075B  2118                  LKB$W_STATUS(R5),60$
              20 A5   D0   075E  2119          MOVL    LKB$L_BLKASTADR(R5),-   ; Store blocking AST address
              10 A5         0761  2120                  LKB$L_AST(R5)
              52   02   9A   0763  2121          MOVZBL  #PRI$_RESAVL,R2         ; Priority increment class
    00000000'GF    16   0766  2122          JSB     G^SCH$QAST              ; Queue AST
               3C   11   076C  2123          BRB     80$
                        076E  2124
                        076E  2125  30$:     ; Lock needs to be converted back to system owned.  Restore old AST
                        076E  2126           ; parameter and convert back to system owned.  Call blocking
                        076E  2127           ; AST subroutine instead of queueing an AST, if necessary.
                        076E  2128           ; Note that this path should NEVER be taken if the NODELETE bit is
                        076E  2129           ; clear (i.e. places that clear the NODELETE bit should also clear
                        076E  2130           ; CVTTOSYS).  There are two reasons for this.  First, if NODELETE
                        076E  2131           ; is clear, then the LKB may already be removed from the PCB lock
                        076E  2132           ; queue and CVT_TO_SYS would do a double REMQUE.  Secondly, the field
                        076E  2133           ; LKB$L_OLDASTPRM is only part of the full LKB; it's not part of
                        076E  2134           ; the ACB portion of the LKB.  Therefore, this code path can only be
                        076E  2135           ; used if we are dealing with the full LKB (see routine FREE_LKB).
                        076E  2136           ; It is for these reasons that this code path branches to 80$
                        076E  2137           ; instead of 60$ when it's finished.
                        076E  2138
            58 A5   D0   076E  2139          MOVL    LKB$L_OLDASTPRM(R5),-   ; Restore old AST parameter
            14 A5         0771  2140                  LKB$L_ASTPRM(R5)
               56   DD   0773  2141          PUSHL   R6                      ; Save R6
          56   55   D0   0775  2142          MOVL    R5,R6                   ; Move LKB address
             FA60   30   0778  2143          BSBW    CVT_TO_SYS_INT          ; Convert to system owned
               56 8ED0   077B  2144          POPL    R6                      ; Restore R6
               01   E1   077E  2145          BBC     #LKB$V_DBLKAST,-        ; Branch if no blocking AST to deliver
          27 2A A5         0780  2146                  LKB$W_STATUS(R5),80$
             0119   30   0783  2147          BSBW    CALL_BLK_SUBR           ; Call blocking subroutine
               22   11   0786  2148          BRB     80$
                        0788  2149
                        0788  2150  40$:     ; We must be delivering a blocking AST
```

```
                        0788  2151
                        0788  2152          SETIPL  #IPL$_SYNCH             ; Raise IPL
                  02    078B  2153          BICW    #LKB$M_DBLKAST,-        ; Clear deliver blocking AST bit
                2A A5   078D  2154                  LKB$W_STATUS(R5)
                        078F  2155
                        078F  2156 60$:     ; Delete LKB if no longer needed.  Increment enqueue quota unless
                        078F  2157          ; the NOQUOTA bit in the LKB is set.  In this case,
                        078F  2158          ; AST quota has already been accounted for in the AST delivery code.
                        078F  2159
                  05    E0    078F  2160          BBS     #LKB$V_NODELETE,-       ; Branch if not deleting
              16 0B A5        0791  2161                  LKB$B_RMOD(R5),80$
                  05    E0    0794  2162          BBS     #LKB$V_NOQUOTA,-        ; Branch if accounting taken care of
              08 2A A5        0796  2163                  LKB$W_STATUS(R5),70$
           50   0080  C4    D0    0799  2164          MOVL    PCB$L_JIB(R4),R0        ; Get JIB address
                 4C  A0    B6    079E  2165          INCW    JIB$W_ENQCNT(R0)        ; Add 1 to enqueue count
                50     55  D0    07A1  2166 70$:     MOVL    R5,R0
          00000000'GF    16    07A4  2167          JSB     G^EXE$DEANONPAGED       ; Deallocate it
                        07AA  2168 80$:     SETIPL  #IPL$_ASTDEL            ; Lower IPL
                  05    07AD  2169          RSB
                        07AE  2170
                        07AE  2171
                        07AE  2172 ;
                        07AE  2173 ; Synchronization notes:
                        07AE  2174 ;
                        07AE  2175 ;       1)  The clearing of the DCPLAST bit and the testing of the
                        07AE  2176 ;           DBLKAST bit (after label 20$) must be done at IPL$_SYNCH
                        07AE  2177 ;           in order to synchronize correctly with the queueing of a
                        07AE  2178 ;           blocking AST by routine LCK$QUEUE_BLOCKAST.  Otherwise, the AST
                        07AE  2179 ;           could be queued twice.
                        07AE  2180 ;
                        07AE  2181 ;       2)  Running the rest of the routine at IPL$_SYNCH (labels 40$ and
                        07AE  2182 ;           80$) is just done for safety's sake.  At this writing, it
                        07AE  2183 ;           is not believed to be necessary.
                        07AE  2184 ;
```

```
                        .SBTTL  LCK$QUEUECVT - Insert a lock on conversion queue
                        .SBTTL  LCK$QUEUEWAIT - Insert a lock on wait queue

                ;++
                ; FUNCTIONAL DESCRIPTION:
                ;
                ;       These routines handle lock requests when they cannot be granted
                ;       immediately.  LCK$QUEUECVT handles conversion requests and
                ;       LCK$QUEUEWAIT handles new lock requests.  These routines also
                ;       queue the lock onto a timeout queue if deadlock checking is enabled.
                ;
                ; CALLING SEQUENCE:
                ;
                ;       BSBW    LCK$QUEUECVT (or LCK$QUEUEWAIT)
                ;       (Note:  IPL must be at IPL$_SYNCH)
                ;
                ; INPUT PARAMETERS:
                ;
                ;       R4      Address of PCB
                ;       R5      Group grant mode without this lock (LCK$QUEUECVT only)
                ;       R6      Address of LKB
                ;       R8      Address of RSB
                ;       R9      Flags
                ;
                ; OUTPUT PARAMETERS:
                ;
                ;       None
                ;
                ; SIDE EFFECTS:
                ;
                ;       All registers except R6 may be clobbered.
                ;
                ;--

                        .IF NDF LOADSW
                        .PSECT  LOCKMGR
                        .ENDC

                        .ENABL  LSB

                        ASSUME  LKB$K_CONVERT  EQ  0

                LCK$QUEUECVT::
38 A6   0E      INSQUE  LKB$L_SQFL(R6),-        ; Insert at end of conversion queue
1C B8                   @RSB$C_CVTQBL(R8)
    04  12      BNEQ    10$                     ; Branch if not first in queue
0D A8   55  90  MOVB    R5,RSB$B_CGMODE(R8)     ; Store conversion grant mode
36 A6   94      CLRB    LKB$B_STATE(R6)         ; Set state = conversion
    10  B3      BITW    #LKB$M_MSTCPY,-         ; Is this is a master copy?
2A A6                   LKB$W_STATUS(R6)
    26  12      BNEQ    15$                     ; Yes
50  40 A6   0F  REMQUE  LKB$L_OWNQFL(R6),R0     ; Remove from PCB lock queue
    10  11      BRB     QUEUE_COMMON            ; Join common code

                LCK$QUEUEWAIT::
38 A6   0E      INSQUE  LKB$L_SQFL(R6),-        ; Insert request at end of wait queue
24 B8                   @RSB$C_WTQBL(R8)
```

```
                        07CD  2243 LCKSQUEUE_REM::
FF 8F    90             07CD  2244          MOVB    #LKB$K_WAITING,-        ; Set state = waiting
36 A6                   07D0  2245                  LKB$B_STATE(R6)
   10    B3             07D2  2246          BITW    #LKB$M_MSTCPY,-         ; Is this is a master copy?
2A A6                   07D4  2247                  LKB$W_STATUS(R6)
   10    12             07D6  2248          BNEQ    15$                     ; Yes
                        07D8  2249
                        07D8  2250 QUEUE_COMMON:
                        07D8  2251
                        07D8  2252          ; Insert lock on process lock queue and clear event flag.
                        07D8  2253
40 A6    0E             07D8  2254          INSQUE  LKB$L_OWNQFL(R6),-      ; Insert at end of PCB lock queue
   0108 D4              07DB  2255                  @PCB$C_LOCKQBL(R4)
53 37 A6    9A          07DE  2256          MOVZBL  LKB$B_EFN(R6),R3        ; Get event flag number
00000000'GF 16          07E2  2257          JSB     G^SCH$CLREFR            ; Clear the event flag
                        07E8  2258
                        07E8  2259 15$:     ; Set ASYNC bit and queue blocking ASTs
                        07E8  2260
        00000002        07E8  2261          .IF NE  CA$_MEASURE
00000000'GF D6          07E8  2262          INCL    G^PMS$GL_ENQWAIT
                        07EE  2263          .ENDC
                        07EE  2264
   04    A8             07EE  2265          BISW    #LKB$M_ASYNC,-          ; Set bit to indicate this request
2A A6                   07F0  2266                  LKB$W_STATUS(R6)        ; will be satisfied asynchronously
2C A6    D4             07F2  2267          CLRL    LKB$L_LKST1(R6)         ; Clear 1st longword of LKSB
42 A8    B5             07F5  2268          TSTW    RSB$W_BLKASTCNT(R8)     ; See if anyone wants a blocking AST
   02    13             07F8  2269          BEQL    20$                     ; No
   31    10             07FA  2270          BSBB    LCK$QUEUE_BLOCKAST      ; Yes, queue blocking ASTs
                        07FC  2271
                        07FC  2272 20$:     ; Insert this lock on timeout queue if deadlock checking is enabled
                        07FC  2273          ; and this lock is mastered on this system and LCK$M_NODLCKWT is
                        07FC  2274          ; not set.
                        07FC  2275
                        07FC  2276          ASSUME  LKB$L_DUETIME  EQ  LKB$L_KAST   ; Note that these fields overlap
                        07FC  2277
      38 A8    D5       07FC  2278          TSTL    RSB$L_CSID(R8)          ; Don't insert process copy locks
         2B    12       07FF  2279          BNEQ    30$
         09    E0       0801  2280          BBS     #LCK$V_NODLCKWT,-       ; Branch if no deadlock wait is set
      26 28 A6           0803  2281                  LKB$W_FLAGS(R6),30$
50 00000000'GF D0       0806  2282          MOVL    G^LCK$GL_WAITTIME,R0    ; Get lock wait time
         1D    13       080D  2283          BEQL    30$                     ; Deadlock checking is disabled
00000000'GF    50 C1    080F  2284          ADDL3   R0,G^EXE$GL_ABSTIM,-    ; Add wait time to current time to
         18 A6           0816  2285                  LKB$L_DUETIME(R6)       ; get duetime
         4E A6    94     0818  2286          CLRB    LKB$B_TSLT(R6)          ; Init. timestamp lifetime
      0040 8F    A8     081B  2287          BISW    #LKB$M_TIMOUTQ,-        ; Set timeout queue bit
         2A A6           081F  2288                  LKB$W_STATUS(R6)
50 00000000'GF DE       0821  2289          MOVAL   G^LCK$GL_TIMOUTQ,R0
         66    0E       0828  2290          INSQUE  LKB$L_ASTQFL(R6),-      ; Insert lock on end of timeout queue
      04 B0             082A  2291                  @4(R0)
                        082C  2292 30$:     RSB
                        082D  2293
                        082D  2294          .DSABL  LSB
```

```
                     082D  2296          .SBTTL  LCK$QUEUE_BLOCKAST - Queue blocking ASTs
                     082D  2297
                     082D  2298 ;++
                     082D  2299 ; FUNCTIONAL DESCRIPTION:
                     082D  2300 ;
                     082D  2301 ;       This routine queues a blocking AST to all locks that meet the
                     082D  2302 ;       following conditions:
                     082D  2303 ;               o  Are on the granted queue
                     082D  2304 ;               o  Have requested a blocking AST
                     082D  2305 ;               o  Have not already received a blocking AST
                     082D  2306 ;               o  Whose granted lock mode is incompatible with
                     082D  2307 ;                  the requested lock mode of the lock being placed in
                     082D  2308 ;                  the conversion or wait queue
                     082D  2309 ;               o  Whose lock state is GRANTED (eliminates locks in a SCS
                     082D  2310 ;                  conversion wait state)
                     082D  2311 ;
                     082D  2312 ;       This routine assumes that the caller has already determined
                     082D  2313 ;       that RSB$W_BLKASTCNT is non-zero, indicating that there is at least
                     082D  2314 ;       one lock requesting a blocking AST.
                     082D  2315 ;
                     082D  2316 ; CALLING SEQUENCE:
                     082D  2317 ;
                     082D  2318 ;       BSBW    LCK$QUEUE_BLOCKAST
                     082D  2319 ;       (Note: IPL must be at IPL$_SYNCH)
                     082D  2320 ;
                     082D  2321 ; INPUTS:
                     082D  2322 ;
                     082D  2323 ;       R6      Address of LKB (being placed on conversion or wait queue)
                     082D  2324 ;       R8      Address of RSB
                     082D  2325 ;
                     082D  2326 ; OUTPUTS:
                     082D  2327 ;
                     082D  2328 ;       None
                     082D  2329 ;
                     082D  2330 ; IMPLICIT OUTPUTS:
                     082D  2331 ;
                     082D  2332 ;       Possibly, a number of blocking ASTs are queued
                     082D  2333 ;
                     082D  2334 ; COMPLETION CODES:
                     082D  2335 ;
                     082D  2336 ;       None
                     082D  2337 ;
                     082D  2338 ; SIDE EFFECTS:
                     082D  2339 ;
                     082D  2340 ;       R0 - R5, R7, R10, and R11 are destroyed
                     082D  2341 ;--
                     082D  2342
                     082D  2343          .IF NDF LOADSW
                0000 082D  2344          .PSECT  LOCKMGR
                     082D  2345          .ENDC
                     082D  2346
                     082D  2347 LCK$QUEUE_BLOCKAST::
5A   34 A6   9A      082D  2348          MOVZBL  LKB$B_RQMODE(R6),R10    ; Get req. lock mode of blocked lock
5B   10 A8   DE      0831  2349          MOVAL   RSB$L_GRQFL(R8),R11     ; Get address of granted queue
   57   5B   D0      0835  2350          MOVL    R11,R7                  ; Save address
   57   67   D0      0838  2351 10$:     MOVL    (R7),R7                 ; Get address of next element in queue
   5B   57   D1      083B  2352          CMPL    R7,R11                  ; Reached the end yet?
```

```
                                                                H 2
                 37   13   083E  2353          BEQL    90$                     ; Yes
          55  57  38   C3   0840  2354          SUBL3   #LKB$L_SQFL,R7,R5      ; No, position to start of LKB
                20 A5   D5   0844  2355          TSTL    LKB$L_BLKASTADR(R5)     ; Blocking AST address specified?
                   EF   13   0847  2356          BEQL    10$                     ; No
              50   35 A5   9A   0849  2357          MOVZBL  LKB$B_GRMODE(R5),R0     ; Get granted lock mode
       E4 F7AD CF4A   50   E0   084D  2358          BBS     R0,LCK$COMPAT_TBL[R10],10$ ; Branch if compatible
                   03   E0   0854  2359          BBS     #LKB$V_BLKASTQED,-      ; Branch if blocking ast already
                  DF 2A A5        0856  2360                  LKB$W_STATUS(R5),10$ ; queued
                   36 A5   91   0859  2361          CMPB    LKB$B_STATE(R5),-       ; Is lock granted?
                   01           085C  2362                  #LKB$K_GRANTED
                   D9   12   085D  2363          BNEQ    10$                     ; No
                   10   B3   085F  2364          BITW    #LKB$M_MSTCPY,-         ; Is this a master copy?
                  2A A5        0861  2365                  LKB$W_STATUS(R5)
                   0A   12   0863  2366          BNEQ    80$                     ; Yes - send a message to other system
                             0865  2367
                 00000002    0865  2368          .IF NE  CA$_MEASURE
          00000000'GF   D6   0865  2369          INCL    G^PMS$GL_BLK_LOC
                             086B  2370          .ENDC
                             086B  2371
                   0B   10   086B  2372          BSBB    LCK$QUEUE_BLKAST        ; No, actually queue an AST
                   C9   11   086D  2373          BRB     10$                     ; Repeat for remaining locks
                             086F  2374
          00000000'GF   16   086F  2375  80$:    JSB     G^LCK$SND_BLKING        ; Send a blocking message
                   C1   11   0875  2376          BRB     10$                     ; Repeat for remaining locks
                             0877  2377
                   05   0877  2378  90$:    RSB
                             0878  2379
                             0878  2380 ;++
                             0878  2381 ; Subroutine to actually queue the blocking AST.
                             0878  2382 ;
                             0878  2383 ; Input:
                             0878  2384 ;       R5      Address of LKB
                             0878  2385 ; Output:
                             0878  2386 ;       R0 - R5 not preserved
                             0878  2387 ;--
                             0878  2388
                             0878  2389          .ENABL  LSB
                             0878  2390
                             0878  2391 LCK$QUEUE_BLKAST::
                0C A5   D5   0878  2392          TSTL    LKB$L_PID(R5)           ; Is this lock system owned?
                   22   13   087B  2393          BEQL    CALL_BLK_SUBR           ; Yes, call blocking subroutine
                             087D  2394
                             087D  2395 QUEUE_BLKAST:
                             087D  2396          ; Deliver a blocking AST to the process owning this lock (LKB in R5)
                             087D  2397
              2A A5   0A   AB  087D  2398          BISW    #LKB$M_BLKASTQED!-      ; Set blocking AST queued and
                             0881  2399                  LKB$M_DBLKAST,LKB$W_STATUS(R5) ; deliver blocking AST status
                   10   88   0881  2400          BISB    #LKB$M_PKAST,-          ; Set piggyback kernel AST bit
                08 A5        0883  2401                  LKB$B_RMOD(R5)
                   00   E0   0885  2402          BBS     #LKB$V_DCPLAST,-        ; Branch if the LKB is already queued
             14 2A A5        0887  2403                  LKB$W_STATUS(R5),70$    ; NOTE: This test is based on the
                             088A  2404                                          ; assumption that the LKB$M_DBLKAST bit
                             088A  2405                                          ; cannot be set since the
                             088A  2406                                          ; LKB$M_BLKASTQED bit was not set.
                20 A5   D0   088A  2407          MOVL    LKB$L_BLKASTADR(R5),-   ; Store blocking AST address
                10 A5        088D  2408                  LKB$L_AST(R5)
          18 A5   FE77 CF   9E   088F  2409          MOVAB   LOCK_KAST,LKB$L_KAST(R5); Store address of kernel AST routine
```

```
      52   02   9A  0895              MOVZBL  #PRI$_RESAVL,R2         ; Store priority increment class
  00000000'GF   16  0898              JSB     G^SCH$QAST              ; Queue the AST
                05  089E   70$:       RSB
                    089F
                    089F   ;++
                    089F   ; Subroutine to call blocking subroutine for system owned locks
                    089F   ;
                    089F   ; Input:
                    089F   ;          R5      Address of LKB
                    089F   ; Output:
                    089F   ;          R0 - R5 not preserved
                    089F   ;--
                    089F
                    089F   CALL_BLK_SUBR:
           02   AA  089F              BICW    #LKB$M_DBLKAST,-        ; Clear deliver blocking AST bit
        2A A5       08A1                      LKB$W_STATUS(R5)
           08   A8  08A3              BISW    #LKB$M_BLKASTQED,-      ; Set blocking AST queued bit
        2A A5       08A5                      LKB$W_STATUS(R5)
   51   14 A5   D0  08A7              MOVL    LKB$L_ASTPRM(R5),R1     ; Get AST parameter
                    08AB
                    08AB              ; Call blocking subroutine.  R5 points to LKB, R1 contains AST
                    08AB              ; parameter.  IPL is at IPL$_SYNCH.  R0 - R5 need not be
                    08AB              ; preserved by subroutine.
                    08AB
        20 B5   16  08AB              JSB     @LKB$L_BLKASTADR(R5)    ; Call blocking subroutine
                05  08AE              RSB
                    08AF
                    08AF              .DSABL  LSB
```

```
                                                J 2
                     08AF  2439          .SBTTL  LCK$COMP_GGMODE - Compute group grant mode
                     08AF  2440
                     08AF  2441 ;++
                     08AF  2442 ; FUNCTIONAL DESCRIPTION:
                     08AF  2443 ;
                     08AF  2444 ;       This routine computes the group grant mode for a particular
                     08AF  2445 ;       resource.  It does this by maximizing the granted lock modes
                     08AF  2446 ;       for all locks in the granted and conversion queues.  Note that
                     08AF  2447 ;       this routine is often called with the lock of interest (to possibly
                     08AF  2448 ;       be granted) not on any queue.
                     08AF  2449 ;
                     08AF  2450 ; CALLING SEQUENCE:
                     08AF  2451 ;
                     08AF  2452 ;       BSBW    LCK$COMP_GGMODE
                     08AF  2453 ;       (Note IPL must be at IPL$_SYNCH)
                     08AF  2454 ;
                     08AF  2455 ; INPUTS:
                     08AF  2456 ;
                     08AF  2457 ;       R8      Address of RSB
                     08AF  2458 ;
                     08AF  2459 ; OUTPUTS:
                     08AF  2460 ;
                     08AF  2461 ;       R5      Group grant mode
                     08AF  2462 ;
                     08AF  2463 ; COMPLETION CODES:
                     08AF  2464 ;
                     08AF  2465 ;       None
                     08AF  2466 ;
                     08AF  2467 ; SIDE EFFECTS:
                     08AF  2468 ;
                     08AF  2469 ;       R0 and R2 are destroyed
                     08AF  2470 ;       Note:  R1 must be preserved
                     08AF  2471 ;--
                     08AF  2472
                     08AF  2473          .IF NDF LOADSW
                00000008AF  2474          .PSECT  LOCKMGR
                     08AF  2475          .ENDC
                     08AF  2476
                     08AF  2477 LCK$COMP_GGMODE::
                     08AF  2478
                     08AF  2479          ASSUME  RSB$L_CVTQFL  EQ  RSB$L_GRQFL+8
                     08AF  2480
          55   D4   08AF  2481          CLRL    R5                      ; Initialize group grant mode
50  10 A8   DE   0881  2482          MOVAL   RSB$L_GRQFL(R8),R0      ; Get address of granted queue
        03   10   0885  2483          BSBB    10$                     ; Compute g.g. mode for that queue
     50   08   C0   0887  2484          ADDL    #8,R0                   ; Get address of conversion queue
                     088A  2485                                          ; fall through to ...
                     088A  2486
                     088A  2487 ; Subroutine to compute group grant mode for a single queue
                     088A  2488
     52   50   D0   088A  2489 10$:     MOVL    R0,R2                   ; Address of queue header
     52   62   D0   088D  2490 20$:     MOVL    (R2),R2                 ; Get address of next element
     50   52   D1   08C0  2491          CMPL    R2,R0                   ; Reached queue header yet?
          0C   13   08C3  2492          BEQL    30$                     ; Yes
55   FD A2   91   08C5  2493          CMPB    LKB$B_GRMODE-LKB$L_SQFL(R2),R5 ; Granted mode greater
                     08C9  2494                                          ; than group grant  mode?
          F2   1B   08C9  2495          BLEQU   20$                     ; No, continue down queue
```

```
                                                K 2
                55   FD A2   9A  08CB  2496          MOVZBL  LKB$B_GRMODE-LKB$L_SQFL(R2),R5 ; Yes, granted mode becomes
                                 08CF  2497                                                 ; group grant mode
                     EC   11   08CF  2498          BRB     20$                              ; Continue down queue
                          05   08D1  2499 30$:      RSB
```

```
                        08D2  2501          .SBTTL  LCK$GRANTCVTS - Grant conversions
                        08D2  2502          .SBTTL  LCK$GRANTWTRS - Grant waiters
                        08D2  2503
                        08D2  2504 ;++
                        08D2  2505 ; FUNCTIONAL DESCRIPTION:
                        08D2  2506 ;
                        08D2  2507 ;       These two routines try to grant waiting conversions or
                        08D2  2508 ;       waiting new locks.  They are called when another lock
                        08D2  2509 ;       is dequeued or converted if there is a possibility that a waiting
                        08D2  2510 ;       lock request may be granted.
                        08D2  2511 ;
                        08D2  2512 ; CALLING SEQUENCE:
                        08D2  2513 ;
                        08D2  2514 ;       BSBW    LCK$GRANTCVTS (or LCK$GRANTWTRS)
                        08D2  2515 ;       (Note: IPL must be at IPL$_SYNCH)
                        08D2  2516 ;
                        08D2  2517 ; INPUT PARAMETERS:
                        08D2  2518 ;
                        08D2  2519 ;       R5      Contains group grant mode
                        08D2  2520 ;       R8      Address of RSB
                        08D2  2521 ;
                        08D2  2522 ; OUTPUT PARAMETERS:
                        08D2  2523 ;
                        08D2  2524 ;       None
                        08D2  2525 ;
                        08D2  2526 ; SIDE EFFECTS:
                        08D2  2527 ;
                        08D2  2528 ;       R0 - R4 are destroyed
                        08D2  2529 ;--
                        08D2  2530
                        08D2  2531          .IF NDF LOADSW
                 000008D2  2532          .PSECT  LOCKMGR
                        08D2  2533          .ENDC
                        08D2  2534
                        08D2  2535          .ENABL  LSB
                        08D2  2536
                        08D2  2537 LCK$GRANTCVTS::
                  56    DD  08D2  2538          PUSHL   R6                      ; Save R6
          56    18    B8  0F  08D4  2539 10$:    REMQUE  @RSB$L_CVTQFL(R8),R6    ; Remove head of conversion queue
                  43    1D  08D8  2540          BVS     70$                     ; Nothing on conversion queue
              56    38    C2  08DA  2541          SUBL    #LKB$L_SQFL,R6          ; Position R6 to start of LKB
        00000000'GF     95  08DD  2542          TSTB    G^LCK$GB_STALLREQS      ; Are we stalling requests?
                  2D    12  08E3  2543          BNEQ    65$                     ; Yes
              51    34    A6  9A  08E5  2544 20$:    MOVZBL  LKB$B_RQMODE(R6),R1     ; Get requested mode of conversion
10 F711 CF45          51    E0  08E9  2545          BBS     R1,LCK$COMPAT_TBL[R5],40$ ; Branch if compat. to grant conversion
              55    35    A6  91  08F0  2546          CMPB    LKB$B_GRMODE(R6),R5     ; Is granted mode = g.g. mode?
                  13    12  08F4  2547          BNEQ    60$                     ; No
                FFB6    30  08F6  2548          BSBW    LCK$COMP_GGMODE         ; Yes, try recomputing g.g. mode
05 F701 CF45          51    E1  08F9  2549          BBC     R1,LCK$COMPAT_TBL[R5],55$ ; Branch if not compatible
                FD08    30  0900  2550 40$:    BSBW    LCK$GRANT_LOCK          ; Grant this conversion
                  CF    11  0903  2551          BRB     10$                     ; Try the next conversion too
          0D A8       55    90  0905  2552 55$:    MOVB    R5,RSB$B_CGMODE(R8)     ; Store conversion grant mode
                38    A6    0E  0909  2553 60$:    INSQUE  LKB$L_SQFL(R6),-        ; Insert lock at head of
                18    A8        090C  2554                  RSB$L_CVTQFL(R8)        ; conversion queue
                   56 8ED0  090E  2555          POPL    R6                      ; Restore R6
                      05    0911  2556          RSB
                            0912  2557
```

```
                        0912  2558 65$:    ; We are stalling some requests - see which ones
                        0912  2559
                     F5 19  0912  2560        BLSS    60$                     ; We are stalling all requests
                     09 E1  0914  2561        BBC     #LKB$V_PROTECT,-        ; We are only stalling protected locks
                 CC 2A A6   0916  2562                LKB$W_STATUS(R6),20$    ; Branch if this is not a protected lock
                     EE 11  0919  2563        BRB     60$                     ; Exit without trying to grant lock
                        091B  2564
                        091B  2565 LCK$GRANTWTRS::
                        091B  2566
                        091B  2567        ; Get here if the conversion queue is empty.
                        091B  2568        ; Try granting waiting locks.  Group grant mode is in R5.
                        091B  2569        ; This routine is different than the one above because we
                        091B  2570        ; must skip over locks in any SCS wait state.
                        091B  2571
                     56 DD  091B  2572        PUSHL   R6                      ; Save R6
                     57 DD  091D  2573 70$:   PUSHL   R7                      ; Save R7
               56    20 A8  9E  091F  2574        MOVAB   RSB$L_WTQFL(R8),R6      ; Get address of wait queue
                  57    56  D0  0923  2575        MOVL    R6,R7                   ; Save in R7
                        0926  2576
                  56    66  D0  0926  2577 75$:   MOVL    (R6),R6                 ; Get next LKB
                  57    56  D1  0929  2578 80$:   CMPL    R6,R7                   ; Reached the end?
                     2A 13  092C  2579        BEQL    90$                     ; Yes
                     FF 8F  91  092E  2580        CMPB    #LKB$K_WAITING,-        ; Is the state = WAITING
                     FE A6      0931  2581                LKB$B_STATE-LKB$L_SQFL(R6)
                     F1 12  0933  2582        BNEQ    75$                     ; No, skip over it
               00000000'GF  95  0935  2583        TSTB    G^LCK$GB_STALLREQS      ; Are we stalling requests?
                     22 12  093B  2584        BNEQ    95$                     ; Yes
                  51    FC A6  9A  093D  2585 85$:   MOVZBL  LKB$B_RQMODE-LKB$L_SQFL(R6),R1 ; Get requested mode
            10 F6B9 CF45    51  E1  0941  2586        BBC     R1,LCK$COMPAT_TBL[R5],90$ ; Branch if incompatible
                     66 DD  0948  2587        PUSHL   (R6)                    ; Save address of next LKB
                  50    66  0F  094A  2588        REMQUE  (R6),R0                 ; Remove from wait queue
                  56    38  C2  094D  2589        SUBL    #LKB$L_SQFL,R6          ; Position R6 to start of LKB
                     FCB8 30  0950  2590        BSBW    LCK$GRANT_LOCK          ; Grant this lock
                        56 8ED0  0953  2591        POPL    R6                      ; Resume queue where we left off
                        D1 11  0956  2592        BRB     80$                     ; Try next waiting lock
                        0958  2593
                        57 8ED0  0958  2594 90$:   POPL    R7                      ; Restore R7
                        56 8ED0  095B  2595        POPL    R6                      ; Restore R6
                           05  095E  2596        RSB
                        095F  2597
                        095F  2598 95$:   ; We are stalling some requests - see which ones
                        095F  2599
                     F7 19  095F  2600        BLSS    90$                     ; We are stalling all requests
                     09 E1  0961  2601        BBC     #LKB$V_PROTECT,-        ; Branch if this is not a protected lock
                 D7 F2 A6   0963  2602                LKB$W_STATUS-LKB$L_SQFL(R6),85$
                     F0 11  0966  2603        BRB     90$                     ; Exit without trying to grant lock
                        0968  2604
                        0968  2605        .DSABL  LSB
```

```
                     0968  2607          .SBTTL  VERIFYLOCKID - Verify lock id
                     0968  2608
                     0968  2609 ;++
                     0968  2610 ; FUNCTIONAL DESCRIPTION:
                     0968  2611 ;
                     0968  2612 ;       VERIFYLOCKID verifies a lock id for correct process ownership
                     0968  2613 ;       and access mode and then converts it into a LKB address.
                     0968  2614 ;
                     0968  2615 ;       VERIFYPARLOCKID is similar except that the lockid is that
                     0968  2616 ;       of a parent lock and the access mode checking is different.
                     0968  2617 ;
                     0968  2618 ; CALLING SEQUENCE:
                     0968  2619 ;
                     0968  2620 ;       BSBW    VERIFYLOCKID
                     0968  2621 ;       Note:   IPL must be at IPL$_SYNCH to verify that an LKB is
                     0968  2622 ;               not deallocated while it is being verified.  After this
                     0968  2623 ;               routine returns, it is permissable to lower IPL to
                     0968  2624 ;               IPL$_ASTDEL because the process that owns this lock
                     0968  2625 ;               cannot interrupt to dequeue it (as long as we're
                     0968  2626 ;               not dealing with a system owned lock).
                     0968  2627 ;
                     0968  2628 ; INPUT PARAMETERS:
                     0968  2629 ;
                     0968  2630 ;       R1      Lock id
                     0968  2631 ;       R4      Address of PCB
                     0968  2632 ;
                     0968  2633 ; OUTPUT PARAMETERS:
                     0968  2634 ;
                     0968  2635 ;       R0      Completion code
                     0968  2636 ;       R1      Access mode of caller (on success only)
                     0968  2637 ;       R6      Address of LKB
                     0968  2638 ;
                     0968  2639 ; COMPLETION CODES:
                     0968  2640 ;
                     0968  2641 ;       SS$_NORMAL      Lock id was valid and converted to LKB address
                     0968  2642 ;       SS$_IVLOCKID    Invalid lock id
                     0968  2643 ;
                     0968  2644 ; SIDE EFFECTS:
                     0968  2645 ;
                     0968  2646 ;       R0 is destroyed
                     0968  2647 ;--
                     0968  2648
                     0968  2649          .IF NDF LOADSW
                00000968  2650          .PSECT  LOCKMGR
                     0968  2651          .ENDC
                     0968  2652
                     0968  2653          .ENABL  LSB
                     0968  2654
                     0968  2655          ASSUME  LKB$V_MODE  EQ  0
                     0968  2656          ASSUME  LKB$S_MODE  EQ  2
                     0968  2657
                     0968  2658 VERIFYLOCKID:
          01   DD    0968  2659          PUSHL   #1
          02   11    096A  2660          BRB     5$
                     096C  2661
                     096C  2662 VERIFYPARLOCKID:
          00   DD    096C  2663          PUSHL   #0
```

```
            56     51  3C 096E 5$:    MOVZWL  R1,R6                  ; Put lockid index in R6
      00000000'GF  56  D1 0971        CMPL    R6,G^LCK$GL_MAXID      ; Is the lock id too big?
                   48  1A 0978        BGTRU   30$                    ; Yes
   50  00000000'GF     D0 097A        MOVL    G^LCK$GL_IDTBL,R0      ; *** May combine with next instr.
            56   6046  D0 0981        MOVL    (R0)[R6],R6            ; Get LKB address
                   3B  18 0985        BGEQ    30$                    ; Unallocated id
         30 A6     51  D1 0987        CMPL    R1,LKB$L_LKID(R6)      ; Check sequence number
                   35  12 098B        BNEQ    30$                    ; Not valid
                   50  DC 098D        MOVPSL  R0                     ; Get current PSL
                   16  EF 098F        EXTZV   #PSL$V_PRVMOD,-        ; Extract previous mode field
        51     50  02     0991                #PSL$S_PRVMOD,R0,R1
   50  0B A6   FC  8F  8B 0994        BICB3   #^XFC,LKB$B_RMOD(R6),R0 ; Get access mode of lock
                   6E  D5 099A        TSTL    (SP)                   ; Determine which acmode checks to make
                   07  13 099C        BEQL    10$                    ; Parent checks
            50     51  91 099E        CMPB    R1,R0                  ; Caller have privilege to access lock?
                   11  1B 09A1        BLEQU   15$                    ; Yes
                   1D  11 09A3        BRB     30$                    ; No
            50     51  91 09A5 10$:   CMPB    R1,R0                  ; Only less priv. modes can be sub-locks
                   18  1F 09A8        BLSSU   30$                    ; to more priv. modes.
        50     50  A6  D0 09AA        MOVL    LKB$L_RSB(R6),R0       ; Get RSB address
         4E A0     51  91 09AE        CMPB    R1,RSB$B_RMOD(R0)      ; Caller have privilege to access res.?
                   0E  1A 09B2        BGTRU   30$                    ; No
            0C A6      D1 09B4 15$:   CMPL    LKB$L_PID(R6),-        ; Compare LKB PID with current
            60 A4         09B7                PCB$L_PID(R4)          ; processes' PID
                   10  12 09B9        BNEQ    50$                    ; Somebody else's id (or 0)
                          09BB
            5E     04  C0 09BB 20$:   ADDL    #4,SP                  ; Remove flag
            50     01  3C 09BE        MOVZWL  S^#SS$_NORMAL,R0       ; Success
                       05 09C1        RSB
                          09C2
            5E     04  C0 09C2 30$:   ADDL    #4,SP                  ; Remove flag
        50   2124  8F  3C 09C5        MOVZWL  #SS$_IVLOCKID,R0       ; Invalid lock id
                       05 09CA        RSB
                          09CB
                          09CB 50$:   ; The caller's PID and the lock's PID don't match.  If this is not
                          09CB        ; a master copy lock, then it may be a system-owned lock.  If it
                          09CB        ; is system-owned and the caller's access mode is EXEC or KERNEL
                          09CB        ; the he can reference this lock.  Otherwise, it is an error.
                          09CB        ; We determine if it is system-owned via two different methods
                          09CB        ; depending on whether we are verifying a parent lock or not.
                          09CB        ; If it is a parent lock, we just need to determine if the CVTSYS
                          09CB        ; flag is set.  Otherwise, we need to verify that the PID is zero.
                          09CB        ; This is because even system owned locks go through transient
                          09CB        ; states when the PID is not zero (e.g. conversion in progress
                          09CB        ; and lock is mastered on another node).  If a system owned lock
                          09CB        ; is in this state (PID non-zero) then it cannot be manipulated
                          09CB        ; by another process.  But it can be used as a parent for other
                          09CB        ; system owned locks.
                          09CB
                   10  B3 09CB        BITW    #LKB$M_MSTCPY,-        ; Is this another system's master copy?
            2A A6         09CD                LKB$W_STATUS(R6)
                   F1  12 09CF        BNEQ    30$                    ; Yes, error
                   6E  D5 09D1        TSTL    (SP)                   ; No, choose system ownership check
                   07  13 09D3        BEQL    60$                    ; Parent lock check
            0C A6      D5 09D5        TSTL    LKB$L_PID(R6)          ; Is this a system lock?
                   07  13 09D8        BEQL    70$                    ; Yes
                   E6  11 09DA        BRB     30$                    ; No, error
```

```
                06   E1  09DC  2721 60$:    BBC     #LCK$V_CVTSYS,-          ; Branch if not system owned
            E1 28 A6        09DE  2722                 LKB$W_FLAGS(R6),30$
             01   51   91  09E1  2723 70$:    CMPB    R1,#PSL$C_EXEC           ; Yes, is the caller privileged?
                  D5   1B  09E4  2724         BLEQU   20$                      ; Yes
                  DA   11  09E6  2725         BRB     30$                      ; No
                           09E8  2726
                           09E8  2727         .DSABL  LSB
```

```
                                        .SBTTL  EXE$DEQ - Dequeue system service

                                ;++
                                ; FUNCTIONAL DESCRIPTION:
                                ;
                                ;       This routine handles the $DEQ system service
                                ;
                                ; CALLING SEQUENCE:
                                ;
                                ;       CALLS/G EXE$DEQ  (Actually called through the system service
                                ;       dispatcher)
                                ;
                                ; INPUT PARAMETERS:
                                ;
                                ;       LOCKID(AP)      Lock id
                                ;       VALBLK(AP)      Address of value block
                                ;       DEQ_ACMODE(AP)  Access mode of locks to dequeue (only used if
                                ;                       DEQALL flag is set)
                                ;       DEQ_FLAGS(AP)   Flags
                                ;
                                ;       R4              Address of PCB
                                ;
                                ; OUTPUT PARAMETERS:
                                ;
                                ;       R0              Completion code
                                ;
                                ; COMPLETION CODES:
                                ;
                                ;       SS$_NORMAL      Successful completion
                                ;       SS$_IVLOCKID    Invalid lock id
                                ;       SS$_ACCVIO      Access violation (on VALBLK)
                                ;       SS$_SUBLOCKS    Lock has sublocks
                                ;       SS$_CANCELGRANT Cannot cancel a granted lock
                                ;--
                                        .IF NDF LOADSW
                00000111                .PSECT  Y$EXEPAGED
                                        .ENDC

                                        .ENABL  LSB

                                        .IF NDF LOADSW
                        0FFC            .ENTRY  EXE$DEQ,^M<R2,R3,R4,R5,R6,R7,R8,R9,R10,R11>
                                        .IFF
                                        .ENTRY  EXE$$DEQ,^M<R2,R3,R4,R5,R6,R7,R8,R9,R10,R11>
                                        .ENDC

                                        ; First see if this is a dequeue of a specific lock or a dequeue
                                        ; of all locks at the specified access mode (maximized with caller's
                                        ; access mode) and outer modes.

                                        ASSUME  LCK$V_DEQALL  EQ  0

51   04 AC    D0                        MOVL    LOCKID(AP),R1           ; Get lock id
55   10 AC    3C                        MOVZWL  DEQ_FLAGS(AP),R5        ; Get dequeue flags
     56 55    E8                        BLBS    R5,DEQ_ALL              ; Branch if dequeue all
```

```
                                011E  2786
                                011E  2787          ; It's a dequeue of a specific lock
                                011E  2788
 59   08 AC    D0               011E  2789          MOVL    VALBLK(AP),R9           ; Get address of value block
           10    13               0122  2790          BEQL    20$                     ; No value block
                                  0124  2791          IFNORD  #16,(R9),25$            ; Branch if value block not readable
 7E   08 A9    7D               012A  2792          MOVQ    8(R9),-(SP)             ; Push value block onto stack
    7E   69    7D               012E  2793          MOVQ    (R9),-(SP)
    59   5E    D0               0131  2794          MOVL    SP,R9                   ; R9 points to value block
                                  0134  2795 20$:     SETIPL  95$                     ; Raise IPL to IPL$_SYNCH and
                                  013B  2796                                          ; lock pages in memory
         082A'    30               013B  2797          BSBW    VERIFYLOCKID            ; Verify lock id and return LKB in R6
       1D 50      E9               013E  2798          BLBC    R0,DEQ_EXIT             ; Error
                                  0141  2799
                                  0141  2800          ; Check to see if we are stalling all requests
                                  0141  2801
00000000'GF      95               0141  2802          TSTB    G^LCK$GB_STALLREQS      ; Are we stalling all requests?
           19    19               0147  2803          BLSS    22$                     ; Yes
                                  0149  2804
                                  0149  2805          ; LKB address is in R6.  Value block address (or 0) is in R9.
                                  0149  2806          ; Dequeue the lock and grant any waiting locks.
                                  0149  2807
         00000002                 0149  2808          .IF NE  CA$_MEASURE
00000000'GF      D6               0149  2809          INCL    G^PMS$GL_DEQ_LOC
                                  014F  2810          .ENDC
                                  014F  2811
    54   55    D0               014F  2812          MOVL    R5,R4                   ; Move flags
         57    D4               0152  2813          CLRL    R7                      ; Use default status
       092E'    30               0154  2814          BSBW    LCK$DEQLOCK             ; Dequeue the lock
0124 8F   50    B1               0157  2815          CMPW    R0,#SS$_INSFMEM         ; Handle insufficient memory
           07    13               015C  2816          BEQL    23$
                                  015E  2817
                                  015E  2818 DEQ_EXIT:
                                  015E  2819          ; Exit $DEQ system service.  Status should already be in R0.
                                  015E  2820
                                  015E  2821          SETIPL  #IPL$_ASTDEL            ; Lower IPL
                             04   0161  2822          RET
                                  0162  2823
         0B2B'    31               0162  2824 22$:     BRW     STALL_REQ               ; Stall request
         0B1A'    31               0165  2825 23$:     BRW     WAIT_FOR_POOL           ; Wait for pool
                                  0168  2826
    50   0C    3C               0168  2827 25$:     MOVZWL  S^#SS$_ACCVIO,R0        ; Access violation
           F1    11               016B  2828          BRB     DEQ_EXIT
                                  016D  2829
50  212C 8F    3C               016D  2830 35$:     MOVZWL  #SS$_SUBLOCKS,R0        ; System lock with sublocks
           EA    11               0172  2831          BRB     DEQ_EXIT
                                  0174  2832
                                  0174  2833 DEQ_ALL:
                                  0174  2834          ; Dequeue all locks at the specified access mode (maximized
                                  0174  2835          ; with caller's mode) and less privileged modes.  Since this list
                                  0174  2836          ; is normally kept in the order locks were taken out, one pass
                                  0174  2837          ; through the list will normally be able to dequeue all the
                                  0174  2838          ; specified locks.  However, two things may cause the list to
                                  0174  2839          ; be out of order.  First of all, waiting locks are kept at the
                                  0174  2840          ; end of list (for the convenience of deadlock detection) and
                                  0174  2841          ; secondly, if a lock with sublocks is converted (and must wait)
                                  0174  2842          ; it ends up out of order on the list.  If the list is out of order,
```

```
                                                F 3
                                0174  2843          ; the result is that we get SS$_SUBLOCKS errors when we try to
                                0174  2844          ; dequeue out of order locks.  It is therefore necessary to count
                                0174  2845          ; these errors and if there are any to repeat the loop, again
                                0174  2846          ; trying to dequeue all the specified loops.  In order to guarantee
                                0174  2847          ; eventual completion we make sure that each time the loop is repeated,
                                0174  2848          ; the number of SS$_SUBLOCKS errors is less than the previous time.
                                0174  2849
                                0174  2850          ASSUME  LKB$V_MODE  EQ  0
                                0174  2851          ASSUME  LKB$S_MODE  EQ  2
                                0174  2852
                  55   02   AA   0174  2853          BICW    #LCK$M_CANCEL,R5            ; Don't allow CANCEL if DEQALL is set
                       55   DD   0177  2854          PUSHL   R5                          ; Save dequeue flags
                  56   51   D0   0179  2855          MOVL    R1,R6                       ; Move parent lock id
                       15   13   017C  2856          BEQL    40$                         ; No parent - dequeue all locks
                                017E  2857          SETIPL  95$                         ; Raise IPL to verify lockid
            00000968'EF   16   0185  2858          JSB     VERIFYLOCKID                ; Convert to LKB address
                  D0   50   E9   018B  2859          BLBC    R0,DEQ_EXIT                 ; Error
                  0C   A6   D5   018E  2860          TSTL    LKB$L_PID(R6)               ; Verify the lock is not system owned
                       DA   13   0191  2861          BEQL    35$                         ; It is - error
                       56   DD   0193  2862  40$:    PUSHL   R6                          ; Save LKB address or zero
                                0195  2863          SETIPL  #IPL$_ASTDEL                ; Lower IPL to allow page faults
50   0C   AC   FFFFFFFC   8F   CB   0198  2864          BICL3   #^C<3S,DEQ_ACMODE(AP),R0; Get specified access mode
            00000000'GF   16   01A1  2865          JSB     G^EXE$MAXACMODE             ; Maximize with previous mode
                  7E   01   CE   01A7  2866          MNEGL   #1,-(SP)                    ; Initialize last error count to -1
                       00   DD   01AA  2867          PUSHL   #0                          ; Initialize current error count to 0
                       50   DD   01AC  2868          PUSHL   R0                          ; Save access mode
                       59   D4   01AE  2869          CLRL    R9                          ; Indicate no value block
                  5A   0104 C4   DE   01B0  2870          MOVAL   PCB$L_LOCKQFL(R4),R10       ; Get address of PCB lock queue head
                       5B   5A   D0   01B5  2871          MOVL    R10,R11                     ; Save in R11
                                01B8  2872
                                01B8  2873  50$:    ; Process next LKB in list.  It's friendly to lower IPL to IPL$_ASTDEL
                                01B8  2874          ; so that system events can occur.  Otherwise we could dequeue
                                01B8  2875          ; thousands of locks staying at IPL$_SYNCH the entire time.
                                01B8  2876          ; But lowering to IPL$_ASTDEL exposes us to at least two race
                                01B8  2877          ; conditions.  The first is that we could have the address of
                                01B8  2878          ; an LKB in R6 (at IPL$_ASTDEL) and deadlock detection could
                                01B8  2879          ; dequeue the lock out from underneath us.  The solution to this
                                01B8  2880          ; is to stay at IPL$_SYNCH between fetching the LKB address and
                                01B8  2881          ; dequeuing it.  Thw other race condition is that by lowering
                                01B8  2882          ; to IPL$_ASTDEL, a waiting lock could be granted, this moving
                                01B8  2883          ; from the tail of the list to the head.  Since we traverse this
                                01B8  2884          ; list from the head to the tail, we could miss this lock.  The
                                01B8  2885          ; solution to this one is to verify that the head of the list
                                01B8  2886          ; doesn't change while we lower and raise IPL.
                                01B8  2887
                  56   6B   D0   01B8  2888          MOVL    (R11),R6                    ; Get first LKB on list
                                01BB  2889          SETIPL  #IPL$_ASTDEL                ; Lower IPL to allow system events
                                01BE  2890          SETIPL  95$                         ; Raise IPL and lock pages in memory
                  6B   56   D1   01C5  2891          CMPL    R6,(R11)                    ; Did the head of the queue change?
                       6A   12   01C8  2892          BNEQ    75$                         ; Yes, start over again
                  56   6A   D0   01CA  2893          MOVL    (R10),R6                    ; Get next LKB in list
                  5B   56   D1   01CD  2894          CMPL    R6,R11                      ; Reached end of list?
                       51   13   01D0  2895          BEQL    70$                         ; Yes
               56     C0   A6   DE   01D2  2896          MOVAL   -LKB$L_OWNQFL(R6),R6        ; Back up R6 to point to start of LKB
50   0B   A6     FC   8F   8B   01D6  2897          BICB3   #^XFC,LKB$B_RMOD(R6),R0    ; Get lock access mode
                  6E   50   91   01DC  2898          CMPB    R0,(SP)                     ; Is lock access mode < spec. mode?
                       3D   1F   01DF  2899          BLSSU   60$                         ; Yes, don't dequeue
```

```
                51   0C AE    D0   01E1  2900          MOVL    12(SP),R1                       ; Get parent LKB address
                       13     13   01E5  2901          BEQL    55$                             ; No parent - dequeue all locks
                                   01E7  2902
                                   01E7  2903          ; Have a candidate lock to dequeue (in R6).  Exit the loop
                                   01E7  2904          ; if the specified parent lock (in R1) has a zero reference count.
                                   01E7  2905          ; Otherwise, see if our candidate lock (in R6) is a sublock of our
                                   01E7  2906          ; parent lock (in R1).
                                   01E7  2907
                      4C A1     B5   01E7  2908          TSTW    LKB$W_REFCNT(R1)                ; Are all its sublocks gone?
                         51     13   01EA  2909          BEQL    80$                             ; Yes
                   50    56     D0   01EC  2910          MOVL    R6,R0                           ; R0 will point to each LKB up the tree
                50   48 A0     D0   01EF  2911  53$:     MOVL    LKB$L_PARENT(R0),R0             ; Move up one level in tree
                         29     13   01F3  2912          BEQL    60$                             ; Reached the top without a match
                      51   50   D1   01F5  2913          CMPL    R0,R1                           ; Does this match specified parent?
                         F5     12   01F8  2914          BNEQ    53$                             ; No, keep going up tree
                                   01FA  2915
                                   01FA  2916  55$:     ; Have an LKB (in R6) to be dequeued.
                                   01FA  2917
                            00000002   01FA  2918          .IF NE  CA$_MEASURE
                00000000'GF     D6   01FA  2919          INCL    G^PMS$GL_DEQ_LOC
                                   0200  2920          .ENDC
                                   0200  2921
                54   10 AE      D0   0200  2922          MOVL    16(SP),R4                       ; Fetch dequeue flags
                         57     D4   0204  2923          CLRL    R7                              ; Use default status
                00000000'GF     95   0206  2924          TSTB    G^LCK$GB_STALLREQS              ; Are we stalling all requests?
                         38     19   020C  2925          BLSS    85$                             ; Yes
                       0874'    30   020E  2926          BSBW    LCK$DEQLOCK                     ; Dequeue it
                          A4 50   E8   0211  2927          BLBS    R0,50$                          ; Branch on success
                                   0214  2928
              0124 8F     50     B1   0214  2929          CMPW    R0,#SS$_INSFMEM                 ; Check for insufficient memory
                         28     13   0219  2930          BEQL    83$
                                   021B  2931
                      04 AE     D6   021B  2932          INCL    4(SP)                           ; Increment error count
                   5A    6A     D0   021E  2933  60$:     MOVL    (R10),R10                       ; Skip this LKB
                         95     11   0221  2934          BRB     50$
                                   0223  2935
                                   0223  2936  70$:     ; Completed a loop through all of the process's locks.  If the
                                   0223  2937          ; current error count is zero, then we're done.  If it's non-zero
                                   0223  2938          ; then we have to run through the list again as long as the error
                                   0223  2939          ; count this time was less than the error count last time.
                                   0223  2940
                      04 AE     D5   0223  2941          TSTL    4(SP)                           ; Test current error count
                         15     13   0226  2942          BEQL    80$                             ; Zero - all done.
            08 AE     04 AE     D1   0228  2943          CMPL    4(SP),8(SP)                     ; Compare current count with last one
                         1A     1E   022D  2944          BGEQU   90$                             ; Bugcheck if it didn't go down
            08 AE     04 AE     D0   022F  2945          MOVL    4(SP),8(SP)                     ; Current count becomes previous count
                      04 AE     D4   0234  2946  75$:     CLRL    4(SP)                           ; Zero current count
                   5A    5B     D0   0237  2947          MOVL    R11,R10                         ; R10 now points to list head again
                       FF7B     31   023A  2948          BRW     50$                             ; Repeat the loop
                                   023D  2949
                   50    01     3C   023D  2950  80$:     MOVZWL  S^#SS$_NORMAL,R0                ; Set completion status
                         FF1B     31   0240  2951          BRW     DEQ_EXIT
                                   0243  2952
                       0A3C'    31   0243  2953  83$:     BRW     WAIT_FOR_POOL                   ; Wait for pool
                       0A47'    31   0246  2954  85$:     BRW     STALL_REQ                       ; Stall request
                                   0249  2955
                                   0249  2956  90$:     BUG_CHECK       DEQSUBLCKS,FATAL
```

```
                     024D  2957
00000008             024D  2958 95$:     .LONG   IPL$_SYNCH              ; End of locked down code
                     0251  2959          ASSUME  .-20$ LE 512            ; Must be on adjacent pages
                     0251  2960          ASSUME  .-DEQ_ALL LE 512
                     0251  2961
                     0251  2962          .DSABL  LSB
```

```
                                                                I 3
                     0251  2964          .SBTTL  LCK$CANCEL_CVT - Cancel a waiting conversion
                     0251  2965
                     0251  2966 ;++
                     0251  2967 ; FUNCTIONAL DESCRIPTION:
                     0251  2968 ;
                     0251  2969 ;       This routine cancels waiting conversions instead of dequeueing them.
                     0251  2970 ;       This means the lock is inserted back on the granted queue at it's
                     0251  2971 ;       old mode.  However, if it was at the head of the conversion queue,
                     0251  2972 ;       then we have to try granting other conversions.  Note that canceled
                     0251  2973 ;       locks get their old blocking AST address restored.  Also, if the lock
                     0251  2974 ;       was formerly a system owned lock, then the CVTTOSYS bit is set so that
                     0251  2975 ;       after the completion AST is delivered, the lock is converted back
                     0251  2976 ;       to a system owned lock.
                     0251  2977 ;
                     0251  2978 ; CALLING SEQUENCE;
                     0251  2979 ;
                     0251  2980 ;       BSBW    LCK$CANCEL_CVT
                     0251  2981 ;       IPL must be at IPL$_SYNCH
                     0251  2982 ;
                     0251  2983 ; INPUTS:
                     0251  2984 ;
                     0251  2985 ;       R6      Address of LKB
                     0251  2986 ;       R7      Final completion status to to store in LKB$L_LKST1 or 0
                     0251  2987 ;               in which case SS$_CANCEL is used (not needed if this is a
                     0251  2988 ;               master copy lock)
                     0251  2989 ;       R8      Address of RSB
                     0251  2990 ;
                     0251  2991 ; OUTPUTS:
                     0251  2992 ;
                     0251  2993 ;       None
                     0251  2994 ;
                     0251  2995 ; SIDE EFFECTS:
                     0251  2996 ;
                     0251  2997 ;       R0 - R4 and R9 are destroyed
                     0251  2998 ;--
                     0251  2999
                     0251  3000          .IF NDF LOADSW
                000009E8  3001          .PSECT  LOCKMGR
                     09E8  3002          .ENDC
                     09E8  3003
                     09E8  3004 LCK$CANCEL_CVT::
          38   C3   09E8  3005          SUBL3   #LKB$L_SQFL,-           ; Save address of lock at the
59   18   A8         09EA  3006                  RSB$L_CVTQFL(R8),R9     ; head of conversion queue
51   38   A6   0F   09ED  3007          REMQUE  LKB$L_SQFL(R6),R1       ; Remove this lock
               04   E0   09F1  3008          BBS     #LKB$V_MSTCPY,-         ; Skip "process" code if this is a
     17 2A   A6         09F3  3009                  LKB$W_STATUS(R6),10$    ; master copy
2C   A6        57   D0   09F6  3010          MOVL    R7,LKB$L_LKST1(R6)      ; Store specified status
               06   12   09FA  3011          BNEQ    5$                      ; Had one
        0830   8F   3C   09FC  3012          MOVZWL  #SS$_CANCEL,-           ; Use default status instead
          2C   A6         0A00  3013                  LKB$L_LKST1(R6)
               07   E1   0A02  3014 5$:       BBC     #LKB$V_WASSYSOWN,-      ; Branch if lock wasn't system owned
     06 2A   A6         0A04  3015                  LKB$W_STATUS(R6),10$
      0100   8F   A8   0A07  3016          BISW    #LKB$M_CVTTOSYS,-       ; Lock should be cvted to system owned
          2A   A6         0A0B  3017                  LKB$W_STATUS(R6)        ; after completion  AST is delivered
          5C   A6   D0   0A0D  3018 10$:      MOVL    LKB$L_OLDBLKAST(R6),-   ; Restore old blocking AST address
          2C   A6         0A10  3019                  LKB$L_BLKASTADR(R6)
51   35   A6   9A   0A12  3020          MOVZBL  LKB$B_GRMODE(R6),R1     ; Get current granted mode
```

```
                                                J 3
                38 A8   D5  0A16  3021          TSTL    RSB$L_CSID(R8)          ; Is this a process copy?
                  14    12  0A19  3022          BNEQ    30$                     ; Yes, skip granting other locks
                FC05    30  0A1B  3023          BSBW    LCK$REGRANTLOCK         ; Regrant this lock
             59   56    D1  0A1E  3024          CMPL    R6,R9                   ; Was it at the head of the queue?
                  0B    12  0A21  3025          BNEQ    20$                     ; No
                        0A23  3026
                        0A23  3027          ; We have regranted a lock that was at the head of the conversion
                        0A23  3028          ; queue.  Therefore, it is necessary to try to grant additional
                        0A23  3029          ; locks.  Also, this will reset the conversion grant mode if we
                        0A23  3030          ; set it incorrectly below.
                        0A23  3031
          55    0C A8   9A  0A23  3032          MOVZBL  RSB$B_GGMODE(R8),R5     ; Get group grant mode
          0D A8   55    90  0A27  3033          MOVB    R5,RSB$B_CGMODE(R8)     ; and set conv. grant mode equal to it
                FEA4    30  0A2B  3034          BSBW    LCK$GRANTCVTS           ; Try granting more locks
                        05  0A2E  3035  20$:     RSB
                        0A2F  3036
                FC2B    30  0A2F  3037  30$:     BSBW    LCK$GRANT_REM           ; Regrant this lock
                        05  0A32  3038          RSB
```

```
                        K 3
0A33  3040          .SBTTL  LCK$DEQLOCK - Dequeue a lock
0A33  3041
0A33  3042  ;++
0A33  3043  ; FUNCTIONAL DESCRIPTION
0A33  3044  ;
0A33  3045  ;       This routine dequeues a specified (by LKB address) lock and
0A33  3046  ;       grants any waiting locks, if possible.  If there are no
0A33  3047  ;       waiters or holders of the lock, the RSB is deallocated.
0A33  3048  ;
0A33  3049  ; CALLING SEQUENCE:
0A33  3050  ;
0A33  3051  ;       BSBW    LCK$DEQLOCK
0A33  3052  ;       IPL must be at IPL$_SYNCH
0A33  3053  ;
0A33  3054  ; INPUT PARAMETERS:
0A33  3055  ;
0A33  3056  ;       R4      Dequeue flags
0A33  3057  ;       R6      Address of LKB
0A33  3058  ;       R7      Contains final status to store in LKB$L_LKST1 if lock
0A33  3059  ;               is not granted (i.e. SS$_DEADLOCK) or 0 which indicates
0A33  3060  ;               a default status should be used (see below).
0A33  3061  ;               (not needed if this is a master copy lock)
0A33  3062  ;       R9      Address of value block or 0 if no value block
0A33  3063  ;               (not needed if this is a CANCEL function)
0A33  3064  ;
0A33  3065  ; OUTPUT PARAMETERS:
0A33  3066  ;
0A33  3067  ;       R0      Completion code
0A33  3068  ;
0A33  3069  ; COMPLETION CODES:
0A33  3070  ;
0A33  3071  ;       In R0:
0A33  3072  ;
0A33  3073  ;       SS$_NORMAL      Successful completion
0A33  3074  ;       SS$_SUBLOCKS    Lock has sublocks
0A33  3075  ;       SS$_CANCELGRANT Cannot cancel a granted lock
0A33  3076  ;       SS$_INSFMEM     Insufficient memory to allocate a CDRP
0A33  3077  ;
0A33  3078  ;       In LKB$L_LKST1 (if R7 = 0)
0A33  3079  ;
0A33  3080  ;       SS$_ABORT - Lock request was aborted
0A33  3081  ;       SS$_CANCEL - Lock request was canceled
0A33  3082  ;
0A33  3083  ; SIDE EFFECTS
0A33  3084  ;
0A33  3085  ;       R0 - R5, and R8 and R9 are clobbered
0A33  3086  ;--
0A33  3087
0A33  3088          .IF NDF LOADSW
00000A33  3089      .PSECT  LOCKMGR
0A33  3090          .ENDC
0A33  3091
0A33  3092          .ENABL  LSB
0A33  3093
0A33  3094  INVALID_STATE:
0A33  3095          BUG_CHECK       LOCKMGRERR,FATAL        ; Invalid lock state
0A37  3096
```

```
                     0A37  3097 REFCNT_ERROR:
50   212C 8F    3C   0A37  3098          MOVZWL  #SS$_SUBLOCKS,R0
                05   0A3C  3099          RSB
                     0A3D  3100
                     0A3D  3101 CANCELGRANT:
50   0E2A 8F    3C   0A3D  3102          MOVZWL  #SS$_CANCELGRANT,R0     ; Granted - can't cancel a granted lock
                05   0A42  3103          RSB
                     0A43  3104
      36 A6     95   0A43  3105 CANCEL: TSTB    LKB$B_STATE(R6)         ; Dispatch on lock state
         46     19   0A46  3106          BLSS    6$                      ; Waiting - handle as ordinary dequeue
            F3  14   0A48  3107          BGTR    CANCELGRANT             ; Granted - error
53   38 A8     D0   0A4A  3108          MOVL    RSB$L_CSID(R8),R3       ; Is resource managed by another system?
            0F  13   0A4E  3109          BEQL    3$                      ; No
00000000'GF     16   0A50  3110          JSB     G^CNX$ALLOC_CDRP        ; Alloc. CDRP (and convert CSID to CSB)
      69 50     E9   0A56  3111          BLBC    R0,NOCDRP               ; None available (or CSID convert error)
00000000'GF     16   0A59  3112          JSB     G^LCK$SND_DEQCV         ; Send a dequeue message
         87     10   0A5F  3113 3$:      BSBB    LCK$CANCEL_CVT          ; Cancel conversion and regrant lock
   50    01     3C   0A61  3114          MOVZWL  S^#SS$_NORMAL,R0        ; Return success
                05   0A64  3115          RSB
                     0A65  3116
                     0A65  3117 SNDDEQ_WAIT:
                     0A65  3118          ; Need to send a message to master system.  Lock is in a
                     0A65  3119          ; waiting state.
                     0A65  3120
00000000'GF     16   0A65  3121          JSB     G^CNX$ALLOC_CDRP        ; Alloc. CDRP (and convert CSID to CSB)
      54 50     E9   0A6B  3122          BLBC    R0,NOCDRP               ; None available (or CSID convert error)
      36 A6     95   0A6E  3123          TSTB    LKB$B_STATE(R6)         ; Is lock in conversion wait?
            09  13   0A71  3124          BEQL    4$                      ; Yes
00000000'GF     16   0A73  3125          JSB     G^LCK$SND_DEQWT         ; No, send a dequeue message
          00FC  31   0A79  3126          BRW     60$                     ; Resume processing
00000000'GF     16   0A7C  3127 4$:      JSB     G^LCK$SND_DEQCV         ; Send a dequeue message
          00F3  31   0A82  3128          BRW     60$
                     0A85  3129
                     0A85  3130 LCK$DEQLOCK::
58   50 A6     D0   0A85  3131          MOVL    LKB$L_RSB(R6),R8        ; Get RSB address
   54    02     B3   0A89  3132          BITW    #LCK$M_CANCEL,R4        ; Is CANCEL flag set?
            B5  12   0A8C  3133          BNEQ    CANCEL                  ; Yes
      4C A6     B5   0A8E  3134 6$:      TSTW    LKB$W_REFCNT(R6)        ; Are there any sub locks?
            A4  12   0A91  3135          BNEQ    REFCNT_ERROR            ; Yes - error
                     0A93  3136
                     0A93  3137          ASSUME  LKB$K_GRANTED  EQ  1
                     0A93  3138          ASSUME  LKB$K_CONVERT  EQ  0
                     0A93  3139          ASSUME  LKB$K_WAITING  EQ  -1
                     0A93  3140
                     0A93  3141          ; Dispatch depending on which queue the lock is on and
                     0A93  3142          ; whether it is managed remotely
                     0A93  3143
50   36 A6     90   0A93  3144          MOVB    LKB$B_STATE(R6),R0      ; Get lock state
            60  14   0A97  3145          BGTR    DEQ_GRANTED             ; Lock is on granted queue
53   38 A8     D0   0A99  3146          MOVL    RSB$L_CSID(R8),R3       ; Is resource managed by another system?
            C6  12   0A9D  3147          BNEQ    SNDDEQ_WAIT             ; Yes
            50  95   0A9F  3148          TSTB    R0                      ; What queue is lock on?
            34  13   0AA1  3149          BEQL    DEQ_CONVERT             ; Lock is on conversion queue
FF 8F       50  91   0AA3  3150          CMPB    R0,#LKB$K_WAITING       ; Make sure state = WAITING
            8A  12   0AA7  3151          BNEQ    INVALID_STATE           ; It's not
                     0AA9  3152
                     0AA9  3153 DEQ_WAIT:
```

```
                                                M 3
                     0AA9  3154          ; The lock is on the waiting queue.  Remove it from the queue and
                     0AA9  3155          ; see if it was at the head of the queue.  If yes, then we may be
                     0AA9  3156          ; able to grant some locks (but only if the conversion queue is empty).
                     0AA9  3157          ; If no, then there is no possibility of granting some locks.
                     0AA9  3158
      51   38 A6    0F  0AA9  3159          REMQUE  LKB$L_SQFL(R6),R1       ; Remove this lock
                10    13  0AAD  3160          BEQL    18$                     ; Wait queue is now empty
      50   18 A8    DE  0AAF  3161          MOVAL   RSB$L_CVTQFL(R8),R0     ; See if we can grant any more locks
           50 60      D1  0AB3  3162          CMPL    (R0),R0                 ; is conversion queue empty?
                1C    12  0AB6  3163          BNEQ    5$                      ; No - can't grant any other locks
      55   0C A8    9A  0AB8  3164          MOVZBL  RSB$B_GGMODE(R8),R5     ; Yes, get group grant mode and
                009C  31  0ABC  3165          BRW     40$                     ; Try granting some waiters
                00B3  31  0ABF  3166 18$:     BRW     55$
                          0AC2  3167
                          0AC2  3168 NOCDRP: ; Either insufficient memory or CSID conversion error.
                          0AC2  3169
0124 8F         50    B1  0AC2  3170          CMPW    R0,#SS$_INSFMEM         ; Is it insufficient memory?
                01    12  0AC7  3171          BNEQ    13$                     ; No
                      05  0AC9  3172          RSB                             ; Yes, return error to caller
                          0ACA  3173 13$:     BUG_CHECK       LOCKMGRERR,FATAL; CSID conversion error
                          0ACE  3174
                          0ACE  3175 SNDDEQ_GRNT:
                          0ACE  3176          ; Need to send a message to master system.  Lock is in
                          0ACE  3177          ; granted state.
                          0ACE  3178
00000000'GF               16  0ACE  3179          JSB     G^LCK$SND_DEQGR         ; Send a dequeue message
                00A1      31  0AD4  3180 5$:      BRW     60$
                          0AD7  3181
                          0AD7  3182 DEQ_CONVERT:
                          0AD7  3183          ; The lock is on the conversion queue.  Remove it from the queue and
                          0AD7  3184          ; see if it was at the head of the queue.  If no, we may be able to
                          0AD7  3185          ; grant some locks due to the granted mode of this lock going away.
                          0AD7  3186          ; If yes, we may be able to grant some locks for the same reason
                          0AD7  3187          ; and for the additional reason of the head of the queue going away.
                          0AD7  3188
                38    C3  0AD7  3189          SUBL3   #LKB$L_SQFL,-           ; Save address of lock at the
      59   18 A8          0AD9  3190                  RSB$L_CVTQFL(R8),R9     ; head of conversion queue
      51   38 A6    0F  0ADC  3191          REMQUE  LKB$L_SQFL(R6),R1       ; Remove this lock
           35 A6    91  0AE0  3192          CMPB    LKB$B_GRMODE(R6),-      ; Is lock mode PW or higher?
                04          0AE3  3193                  #LCK$K_PWMODE
                0C    1F  0AE4  3194          BLSSU   7$                      ; No, skip value block processing
           54   04    B3  0AE6  3195          BITW    #LCK$M_INVVALBLK,R4     ; Should value block be invalidated?
                07    13  0AE9  3196          BEQL    7$                      ; No
                02    A8  0AEB  3197          BISW    #RSB$M_VALINVLD,-       ; Yes, invalidate value block
                  0E  A8  0AED  3198                  RSB$W_STATUS(R8)
                3C  A8    D6  0AEF  3199          INCL    RSB$L_VALSEQNUM(R8)     ; Increment value block sequence number
           59   56    D1  0AF2  3200 7$:      CMPL    R6,R9                   ; Was it the first one on the queue?
                70    13  0AF5  3201          BEQL    50$                     ; Yes
                67    11  0AF7  3202          BRB     45$                     ; No
                          0AF9  3203
                          0AF9  3204 DEQ_GRANTED:
                          0AF9  3205          ; The lock is on the granted queue.  Remove it from the queue
                          0AF9  3206          ; and see if it was the only one on the queue.  If it was, then see
                          0AF9  3207          ; if the conversion and wait queues are also empty, and if so then
                          0AF9  3208          ; the resource block can be deallocated.  This situation is special cased
                          0AF9  3209          ; because it is the normal case.  If this lock is not the only one on the
                          0AF9  3210          ; queue, then see if its granted mode is equal to the group grant mode.
```

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                                0AF9  3211          ; If yes, we may be able to grant some locks if this lock (only) was
                                0AF9  3212          ; responsible for the group grant mode.  If no, then we can't
                                0AF9  3213          ; grant any more locks because the group grant mode won't change.
                                0AF9  3214
                                0AF9  3215          ASSUME  RSB$L_WTQFL  EQ  RSB$L_CVTQFL+8
                                0AF9  3216
          53    38 A8    D0     0AF9  3217          MOVL    RSB$L_CSID(R8),R3       ; Is resource managed by another system?
                   09    13     0AFD  3218          BEQL    8$                      ; No
          00000000'GF    16     0AFF  3219          JSB     G^CNX$ALLOC_CDRP        ; No, get one (and convert CSID to CSB)
                   BA    50     E9    0B05  3220    BLBC    R0,NOCDRP               ; None available or CSID convert error
                   35    A6     91    0B08  3221 8$: CMPB    LKB$B_GRMODE(R6),-      ; Is lock mode PW or higher?
                   04                 0B0B  3222          #LCK$K_PWMODE
                   20    1F     0B0C  3223          BLSSU   12$                     ; No, skip value block processing
                   59    D5     0B0E  3224          TSTL    R9                      ; Value block specified?
                   10    13     0B10  3225          BEQL    10$                     ; No
                28 A8    69     7D    0B12  3226    MOVQ    (R9),RSB$Q_VALBLK(R8)   ; Yes, copy caller's value block to RSB
              30 A8 08   A9     7D    0B16  3227    MOVQ    8(R9),RSB$Q_VALBLK+8(R8)
                   3C    A8     D6    0B1B  3228    INCL    RSB$L_VALSEQNUM(R8)     ; Increment value block sequence number
                   02    AA     0B1E  3229          BICW    #RSB$M_VALINVLD,-       ; Validate value block
                   0E    A8           0B20  3230          RSB$W_STATUS(R8)
                   54    04     B3    0B22  3231 10$: BITW    #LCK$M_INVVALBLK,R4     ; Should value block be invalidated?
                   07    13     0B25  3232          BEQL    12$                     ; No
                   02    A8     0B27  3233          BISW    #RSB$M_VALINVLD,-       ; Yes, invalidate value block
                   0E    A8           0B29  3234          RSB$W_STATUS(R8)
                   3C    A8     D6    0B2B  3235    INCL    RSB$L_VALSEQNUM(R8)     ; Increment value block sequence number
                   20    A6     D5    0B2E  3236 12$: TSTL    LKB$L_BLKASTADR(R6)     ; Blocking AST address specified?
                   03    13     0B31  3237          BEQL    15$                     ; No
                   42    A8     B7    0B33  3238          DECW    RSB$W_BLKASTCNT(R8)     ; Decr. blocking AST count
                                0B36  3239
                   53    D5     0B36  3240 15$: TSTL    R3                      ; Resource managed remotely?
                   94    12     0B38  3241          BNEQ    SNDDEQ_GRNT             ; Yes
              50   38 A6    0F     0B3A  3242    REMQUE  LKB$L_SQFL(R6),R0        ; Remove lock from granted queue
                   20    12     0B3E  3243          BNEQ    45$                     ; Branch if queue not empty
              50   18 A8    DE     0B40  3244    MOVAL   RSB$L_CVTQFL(R8),R0     ; Get address of conversion queue
                50    60    D1     0B44  3245    CMPL    (R0),R0                 ; Is conversion queue empty?
                   1E    12     0B47  3246          BNEQ    50$                     ; No
                50    08    C0     0B49  3247    ADDL    #8,R0                   ; Yes, get address of wait queue
                50    60    D1     0B4C  3248    CMPL    (R0),R0                 ; Is wait queue empty?
                   05    12     0B4F  3249          BNEQ    35$                     ; No, try granting waiters
                                0B51  3250
                                0B51  3251          ; All queues are empty.  Deallocate RSB (as long as it's not
                                0B51  3252          ; a directory entry).
                                0B51  3253
                 00DD    30     0B51  3254          BSBW    LCK$DEALLOC_RSB
                   22    11     0B54  3255          BRB     60$                     ; Finish up
                                0B56  3256
                                0B56  3257 35$: ; Try granting waiting locks
                                0B56  3258
                                0B56  3259          ASSUME  RSB$B_CGMODE  EQ  RSB$B_GGMODE+1
                                0B56  3260
                   0C A8    B4     0B56  3261          CLRW    RSB$B_GGMODE(R8)        ; Clear group and conversion grant mode
                      55    D4     0B59  3262          CLRL    R5                      ; Clear group grant mode in R5
                                0B5B  3263
                 FDBD    30     0B5B  3264 40$: BSBW    LCK$GRANTWTRS           ; Try granting waiters
                   18    11     0B5E  3265          BRB     60$
                                0B60  3266
                                0B60  3267 45$: ; Determine if the lock dequeued was equal to the conversion
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                        0B60  3268          ; grant mode.  If not, then no new locks can be granted.
                        0B60  3269
                 35 A6  91    0B60  3270          CMPB    LKB$B_GRMODE(R6),-      ; Is the granted mode of this lock
                 0D A8        0B63  3271                  RSB$B_CGMODE(R8)        ; equal to the conversion grant mode?
                    11  12    0B65  3272          BNEQ    60$                     ; No, don't bother going further
                        0B67  3273
                        0B67  3274 50$:       ; Either we dequeued a lock equal to the conversion grant mode
                        0B67  3275          ; or we dequeued the head of the converson queue.  Either way,
                        0B67  3276          ; we must recompute the group grant mode.
                        0B67  3277
                    FD45  30    0B67  3278          BSBW    LCK$COMP_GGMODE         ; New group grant mode in R5
              0C A8      55  90  0B6A  3279          MOVB    R5,RSB$B_GGMODE(R8)     ; Store in RSB
              0D A8      55  90  0B6E  3280          MOVB    R5,RSB$B_CGMODE(R8)     ; Also store conversion grant mode
                    FD5D  30    0B72  3281          BSBW    LCK$GRANTCVTS           ; Try granting conversions and waiters
                    00A0  30    0B75  3282 55$:     BSBW    LCK$CHECK_RSB           ; Deallocate RSB, if necessary
                        0B78  3283
                        0B78  3284 60$:       ; Now finish cleaning up the lock we originally dequeued.
                        0B78  3285          ; First,  decrement parent LKB's  sub LKB reference count.
                        0B78  3286
              50     48 A6  D0    0B78  3287          MOVL    LKB$L_PARENT(R6),R0     ; Get parent LKB address
                        05  13    0B7C  3288          BEQL    65$                     ; No parent
                     4C A0  B7    0B7E  3289          DECW    LKB$W_REFCNT(R0)        ; Decrement parent's sub LKB ref. count
                        49  19    0B81  3290          BLSS    75$                     ; Ref. count went negative
                        0B83  3291
                        0B83  3292 65$:       ; Deallocate lock id
                        0B83  3293
              50     30 A6  3C    0B83  3294          MOVZWL  LKB$L_LKID(R6),R0       ; Get lock id index
        51    00000000'GF  D0    0B87  3295          MOVL    G^LCK$GL_IDTBL,R1       ; *** Combine with next instr.
           51     6140     DE    0B8E  3296          MOVAL   (R1)[R0],R1             ; Point to table entry
        61    00000000'GF  B0    0B92  3297          MOVW    G^LCK$GL_NXTID,(R1)     ; Store next id in this id's slot
  02 A1    32 A6     01  A1    0B99  3298          ADDW3   #1,LKB$L_LKID+2(R6),2(R1) ; Incr. and store sequence number
                        04  1C    0B9F  3299          BVC     70$                     ; Didn't overflow to a system address
              02 A1     01  B0    0BA1  3300          MOVW    #1,2(R1)                ; Overflowed - restart seq. number at 1
     00000000'GF        50  D0    0BA5  3301 70$:     MOVL    R0,G^LCK$GL_NXTID       ; This id becomes the next one
                        0BAC  3302
                        0BAC  3303          ; If this lock is a master copy or system owned, then skip
                        0BAC  3304          ; following "process" code and just deallocate LKB.  Both of these
                        0BAC  3305          ; conditions have a zero PID field in the LKB.
                        0BAC  3306
                 0C A6  D5    0BAC  3307          TSTL    LKB$L_PID(R6)           ; Is it either?
                        5A  13    0BAF  3308          BEQL    87$                     ; Yes
                        0BB1  3309
                        0BB1  3310          ; Remove LKB from owner's lock queue.  If the lock was not
                        0BB1  3311          ; granted yet, then complete the request (queue an AST and
                        0BB1  3312          ; set event flag) with the status in R7.
                        0BB1  3313
                        0BB1  3314          ASSUME  LKB$K_GRANTED  EQ  1
                        0BB1  3315          ASSUME  LKB$K_CONVERT  EQ  0
                        0BB1  3316          ASSUME  LKB$K_WAITING  EQ  -1
                        0BB1  3317
           50     40 A6  0F    0BB1  3318          REMQUE  LKB$L_OWNQFL(R6),R0
                 36 A6  95    0BB5  3319          TSTB    LKB$B_STATE(R6)         ; Is the lock granted?
                    16  14    0BB8  3320          BGTR    80$                     ; Yes
              2C A6     57  D0    0BBA  3321          MOVL    R7,LKB$L_LKST1(R6)      ; No, store specified status
                        04  12    0BBE  3322          BNEQ    73$                     ; Had one
                        2C  3C    0BC0  3323          MOVZWL  S^#SS$_ABORT,-          ; Use default status instead
                     2C A6        0BC2  3324                  LKB$L_LKST1(R6)
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                     20   8A  0BC4  3325 73$:    BICB    #LKB$M_NODELETE,-        ; Clear nodelete bit
                 0B A6        0BC6  3326          LKB$B_RMOD(R6)
                   FAE3   30  0BC8  3327          BSBW    QUEUE_AST                ; Queue AST and set event flag;
                                0BCB  3328                                           ; returns status on R0.  Kernel AST
                                0BCB  3329                                           ; routine will delete LKB.
                          05    0BCB  3330          RSB
                                0BCC  3331
                                0BCC  3332 75$:     BUG_CHECK       LKBREFNEG,FATAL
                                0BD0  3333
                                0BD0  3334 80$:     ; Increment the enqueue count and deallocate the LKB as long
                                0BD0  3335          ; as it's not queued to deliver an AST.  If it is queued, then
                                0BD0  3336          ; if it's queued to deliver a completion AST then let kernel AST
                                0BD0  3337          ; routine delete the LKB.  If it's only queued for a blocking
                                0BD0  3338          ; AST then remove it from the AST queue.
                                0BD0  3339
             2A A6   03         0BD0  3340          BITW    #LKB$M_DCPLAST!-         ; Is the LKB queued for AST delivery?
                                0BD4  3341                  LKB$M_DBLKAST,LKB$W_STATUS(R6)
                       18   13  0BD4  3342          BEQL    85$                      ; No
                       20   8A  0BD6  3343          BICB    #LKB$M_NODELETE,-        ; Yes, clear nodelete bit
                 0B A6        0BD8  3344                  LKB$B_RMOD(R6)
                            AA  0BDA  3345          BICW    #LKB$M_DBLKAST-          ; Clear deliver blocking AST bit
                                0BDB  3346                  !LKB$M_CVTTOSYS,-        ; and convert to system owned bit
          2A A6   0102      8F  0BDB  3347                  LKB$W_STATUS(R6)
                       00   E0  0BE0  3348          BBS     #LKB$V_DCPLAST,-         ; Branch if queued for a completion AST
                 2F 2A A6       0BE2  3349                  LKB$W_STATUS(R6),90$     ; (will be deall. when AST is delivered)
                       55   56  D0  0BE5  3350          MOVL    R6,R5                    ; Blocking AST only - remove from
              00000000'GF   16   0BE8  3351          JSB     G^SCH$REMOVACB           ; AST queue
                                0BEE  3352
                                0BEE  3353 85$:     ; Deallocate LKB and increment enqueue quota (if it was charged)
                                0BEE  3354
                       20   B3  0BEE  3355          BITW    #LKB$M_NOQUOTA,-         ; Was enqueue quota charged?
                 2A A6        0BF0  3356                  LKB$W_STATUS(R6)
                       17   12  0BF2  3357          BNEQ    87$                      ; No
                 54    0C A6  3C  0BF4  3358          MOVZWL  LKB$L_PID(R6),R4         ; Get process index
           50    00000000'GF   D0  0BF8  3359          MOVL    G^SCH$GL_PCBVEC,R0       ; *** Combine this and next inst. when
                                0BFF  3360                                           ;  PIC code is no longer needed ***
                 54    6044   D0  0BFF  3361          MOVL    (R0)[R4],R4              ; Convert to PCB address
              50    0080 C4   D0  0C03  3362          MOVL    PCB$L_JIB(R4),R0         ; Get address of JIB
                       4C A0  B6  0C08  3363          INCW    JIB$W_ENQCNT(R0)         ; Increment enqueue count
                       50   56  D0  0C0B  3364 87$:     MOVL    R6,R0                    ; Address of LKB
                 00000000'GF   16  0C0E  3365          JSB     G^EXE$DEANONPAGED        ; Deallocate it
                                0C14  3366
                       50   01  3C  0C14  3367 90$:     MOVZWL  S^#SS$_NORMAL,R0
                                05  0C17  3368          RSB
                                0C18  3369
                                0C18  3370
                                0C18  3371          .DSABL  LSB
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                                    D 4
0C18  3373          .SBTTL  LCK$CHECK_RSB - Deallocate RSB if necessary
0C18  3374
0C18  3375  ;++
0C18  3376  ; FUNCTIONAL DESCRIPTION:
0C18  3377  ;
0C18  3378  ;       This routine checks to see if all queues on a resource
0C18  3379  ;       are empty.  If they are, the resource can be deleted
0C18  3380  ;       as long as it's not needed to act as a directory entry.
0C18  3381  ;
0C18  3382  ; CALLING SEQUENCE:
0C18  3383  ;
0C18  3384  ;       BSBW    LCK$CHECK_RSB
0C18  3385  ;       BSBW    LCK$DEALLOC_RSB is an entry point to use if all three queues
0C18  3386  ;               are known to be empty.
0C18  3387  ;       IPL must be at IPL$_SYNCH
0C18  3388  ;
0C18  3389  ; INPUT PARAMETERS:
0C18  3390  ;
0C18  3391  ;       R8      Address of RSB
0C18  3392  ;
0C18  3393  ; OUTPUT PARAMETERS:
0C18  3394  ;
0C18  3395  ;       None
0C18  3396  ;
0C18  3397  ; SIDE EFFECTS:
0C18  3398  ;
0C18  3399  ;       R0 - R5 are destroyed
0C18  3400  ;
0C18  3401  ; NOTES:
0C18  3402  ;
0C18  3403  ;       If all queues are empty and the RSB is not a root RSB then it
0C18  3404  ;       can be deleted.  If it is a root RSB then the situation is more
0C18  3405  ;       complicated as the RSB may still be needed to act as a directory
0C18  3406  ;       entry.  The following table summarizes what action must be taken.
0C18  3407  ;
0C18  3408  ;                                       This is a directory entry
0C18  3409  ;                                         (RSB$M_DIRENTRY = 1)
0C18  3410  ;
0C18  3411  ;                               |     Yes       |       No
0C18  3412  ;                       --------+---------------+-----------------
0C18  3413  ;                               |               |  Delete RSB
0C18  3414  ;       This system     Yes     |  Delete RSB   |  Send msg to
0C18  3415  ;       is managing             |               |  directory system
0C18  3416  ;       the resource    --------+---------------+-----------------
0C18  3417  ;       (RSB$L_CSID =           |  Leave RSB    |
0C18  3418  ;        0)             No      |  as directory |  Delete RSB
0C18  3419  ;                               |  entry        |
0C18  3420  ;                       --------+---------------+-----------------
0C18  3421  ;--
0C18  3422
0C18  3423
0C18  3424          .ENABL  LSB
0C18  3425
0C18  3426          ASSUME  RSB$L_CVTQFL  EQ  RSB$L_GRQFL+8
0C18  3427          ASSUME  RSB$L_WTQFL   EQ  RSB$L_CVTQFL+8
0C18  3428
0C18  3429  LCK$CHECK_RSB::
```

```
                50    10 A8    DE   0C18  3430          MOVAL   RSB$L_GRQFL(R8),R0      ; Get address of granted queue
                   50    60    D1   0C1C  3431          CMPL    (R0),R0                 ; Is granted queue empty?
                         58    12   0C1F  3432          BNEQ    55$                     ; No
                   50    08    C0   0C21  3433          ADDL    #8,R0                   ; Yes, get address of conversion queue
                   50    60    D1   0C24  3434          CMPL    (R0),R0                 ; Is conversion queue empty?
                         50    12   0C27  3435          BNEQ    55$                     ; No
                   50    08    C0   0C29  3436          ADDL    #8,R0                   ; Yes, get address of wait queue
                   50    60    D1   0C2C  3437          CMPL    (R0),R0                 ; Is wait queue empty?
                         48    12   0C2F  3438          BNEQ    55$                     ; No
                               0C31  3439
                               0C31  3440 LCK$DEALLOC_RSB::
                               0C31  3441          ; All queues are empty.  Delete RSB and/or send message to
                               0C31  3442          ; directory system as appropriate (see above table).
                               0C31  3443
                               0C31  3444          ASSUME  RSB$L_HSHCHN  EQ  0
                               0C31  3445          ASSUME  RSB$L_HSHCHNBK  EQ  RSB$L_HSHCHN+4
                               0C31  3446          ASSUME  RSB$M_DIRENTRY  EQ  1
                               0C31  3447
                   40 A8    B5   0C31  3448          TSTW    RSB$W_REFCNT(R8)        ; Verify there are no sub RSB's
                         44    12   0C34  3449          BNEQ    60$                     ; There are
                50    48 A8    D0   0C36  3450          MOVL    RSB$L_PARENT(R8),R0     ; Get parent RSB address
                         23    12   0C3A  3451          BNEQ    25$                     ; There is a parent
                               0C3C  3452
                07 0E A8    E9   0C3C  3453          BLBC    RSB$W_STATUS(R8),15$    ; Branch if this is not a dir. entry
                   38 A8    D5   0C40  3454          TSTL    RSB$L_CSID(R8)          ; Is this system managing this resource?
                         1F    13   0C43  3455          BEQL    35$                     ; Yes - resource can be deleted
                         32    11   0C45  3456          BRB     55$                     ; This is a directory entry; don't delete
                   38 A8    D5   0C47  3457 15$:      TSTL    RSB$L_CSID(R8)          ; Is this system managing the resource?
                         18    12   0C4A  3458          BNEQ    35$                     ; No - Just delete resource
                               0C4C  3459
                               0C4C  3460          ; Have to send a remove directory entry message to directory system
                               0C4C  3461
                   50    68    7D   0C4C  3462          MOVQ    RSB$L_HSHCHN(R8),R0     ; Get hash chain pointers in R0 and R1
                   61    50    D0   0C4F  3463          MOVL    R0,RSB$L_HSHCHN(R1)     ; Store next pointer in previous RSB or
                               0C52  3464                                              ; hash table
                         04    13   0C52  3465          BEQL    20$                     ; Branch if no next one
                04 A0    51    D0   0C54  3466          MOVL    R1,RSB$L_HSHCHNBK(R0)   ; Store previous pointer in next one
00000000'GF              16    0C58  3467 20$:      JSB     G^LCK$SND_RMVDIR        ; Send remove directory entry message
                         05    0C5E  3468          RSB
                               0C5F  3469
                   40 A0    B7   0C5F  3470 25$:      DECW    RSB$W_REFCNT(R0)        ; Decrement parent's sub RSB ref. count
                         1A    19   0C62  3471          BLSS    70$                     ; Ref. count went negative
                   50    68    7D   0C64  3472 35$:      MOVQ    RSB$L_HSHCHN(R8),R0     ; Get hash chain pointers in R0 and R1
                   61    50    D0   0C67  3473          MOVL    R0,RSB$L_HSHCHN(R1)     ; Store next pointer in previous RSB or
                               0C6A  3474                                              ; hash table
                         04    13   0C6A  3475          BEQL    45$                     ; Branch if no next one
                04 A0    51    D0   0C6C  3476          MOVL    R1,RSB$L_HSHCHNBK(R0)   ; Store previous pointer in next one
                   50    58    D0   0C70  3477 45$:      MOVL    R8,R0
00000000'GF              16    0C73  3478          JSB     G^EXE$DEANONPAGED       ; Deallocate RSB
                         05    0C79  3479 55$:      RSB
                               0C7A  3480
                               0C7A  3481 60$:      BUG_CHECK       RSBREFNZRO,FATAL
                               0C7E  3482 70$:      BUG_CHECK       RSBREFNEG,FATAL
                               0C82  3483
                               0C82  3484          .DSABL  LSB
```

```
                                                .SBTTL  STALL_REQ - Stall request during failover

                                        ;++
                                        ; FUNCTIONAL DESCRIPTION:
                                        ;
                                        ;       This routine stalls requests during failover by putting the
                                        ;       process into MWAIT state waiting for resource RSN$_CLUSTRAN.
                                        ;       It is assumed that the request has been backed up and all cleanup
                                        ;       has been performed as this routine backs up the service and
                                        ;       waits in the caller's mode.
                                        ;
                                        ;       The alternate entry point WAIT_FOR_POOL operates in the same
                                        ;       way but waits for non-paged pool as oppposed to a cluster transition.
                                        ;
                                        ;       The alternate entry point LCK$CHECK_STALL includes a test to
                                        ;       determine if we should stall.
                                        ;
                                        ; CALLING SEQUENCE:
                                        ;
                                        ;       BRW     STALL_REQ
                                        ;       BRW     WAIT_FOR_POOL
                                        ;
                                        ;       NOTE:   These routines do not return to the caller.  Rather they back
                                        ;               up the service and wait in the mode of the caller.  When
                                        ;               the resource becomes available, the service is re-executed.
                                        ;
                                        ;       JSB     LCK$CHECK_STALL (Either returns to caller or backs up
                                        ;                                system service call)
                                        ;       IPL must be at IPL$_SYNCH
                                        ;
                                        ; INPUT PARAMETERS:
                                        ;
                                        ;       None
                                        ;
                                        ; IMPLICIT INPUTS:
                                        ;
                                        ;       It is assumed that these routines are being called from the context
                                        ;       of a system service and that FP has not been tinkered with.
                                        ;
                                        ; OUTPUT PARAMETERS:
                                        ;
                                        ;       None
                                        ;
                                        ; SIDE EFFECTS:
                                        ;
                                        ;       The service is backed out
                                        ;--
                                        ;
                                        WAIT_FOR_POOL:
50  03  D0                              MOVL    #RSN$_NPDYNMEM,R0       ; Set resource to wait for
    0C  11                              BRB     WAIT_COM
                                        LCK$CHECK_STALL::
00000000'GF  95                         TSTB    G^LCK$GB_STALLREQS      ; Are we stalling all requests?
    01  19                              BLSS    STALL_REQ               ; Yes
        05                              RSB
                                        STALL_REQ:
50  0E  D0                              MOVL    #RSN$_CLUSTRAN,R0       ; Set resource to wait for
```

```
                                G 4
                    0C93  3543 WAIT_COM:
54  00000000'GF     DO  0C93  3544          MOVL    G^SCH$GL_CURPCB,R4      ; Set our PCB address
       5E   5D      DO  0C9A  3545          MOVL    FP,SP                   ; Trim stack back to start of frame
     5C   08 AE    7D  0C9D  3546          MOVQ    8(SP),AP                ; Restore pre-call AP and FP
       5E   00'     C0  0CA1  3547          ADDL    S^#EXE$C_CMSTKSZ,SP     ; Clean call frame off stack
       6E   04      C2  0CA4  3548          SUBL    #4,(SP)                 ; Back up saved PC to point to CHMK
00000000'GF         17  0CA7  3549          JMP     G^SCH$RWAIT             ; Wait
```

```
                                                H 4
                                                
                                                .SBTTL  LCK$EXTEND_IDTBL - Extend lock id. table
                                                
                                                ;++
                                                ; FUNCTIONAL DESCRIPTION:
                                                ;
                                                ;       This routine extends the lock id. table if it hasn't already
                                                ;       reached it's maximum size.
                                                ;
                                                ; CALLING SEQUENCE:
                                                ;
                                                ;       BSBW    LCK$EXTEND_IDTBLW - To be called when in process context.
                                                ;                                   If non-paged pool is not available
                                                ;                                   the system service will be backed out
                                                ;                                   and the caller will wait.
                                                ;       BSBW    LCK$EXTEND_IDTBL  - To be called when in fork context.
                                                ;                                   This entry point will not wait for pool
                                                ;                                   and will instead return an error to the
                                                ;                                   caller.
                                                ;       IPL must be at IPL$_SYNCH
                                                ;
                                                ; INPUT PARAMETERS:
                                                ;
                                                ;       R0      Address of cleanup routine or 0 (LCK$EXTEND_IDTBLW only)
                                                ;
                                                ; IMPLICIT INPUTS:
                                                ;
                                                ;       Various lock manager memory cells and SYSGEN parameters
                                                ;       (LCK$GL_MAXID, LCK$GL_IDTBLSIZ, etc.)
                                                ;
                                                ; OUTPUT PARAMETERS:
                                                ;
                                                ;       R0      Completion code
                                                ;
                                                ; COMPLETION CODES:
                                                ;
                                                ;       SS$_INSFMEM     Insufficient non-paged pool
                                                ;       SS$_NOLOCKID    Table has already been expanded to the maximum
                                                ;
                                                ; SIDE EFFECTS:
                                                ;
                                                ;       R1 - R4 are destroyed
                                                ;--
                                                
                                                        .ENABL  LSB
                                                
50   0E12 8F    3C  5$:     MOVZWL  #SS$_NOLOCKID,R0        ; Indicate error
                05  10$:    RSB
                
                LCK$EXTEND_IDTBL::
52   00000000'GF    9E          MOVAB   G^EXE$ALONONPAGED,R2    ; Address of allocate routine
                07  11          BRB     15$
                
                LCK$EXTEND_IDTBLW::
52   00000000'GF    9E          MOVAB   G^EXE$ALONPAGWAITS,R2   ; Address of allocate routine
                
                15$:    ; Check that we haven't already exceeded the maximum table size
```

```
                                                                1  4
                51   00000000'GF   D0  0CC3  3608          MOVL    G^LCK$GL_MAXID,R1       ; Get current largest lock id.
          00000000'GF    51   D1  0CCA  3609          CMPL    R1,G^LCK$GL_IDTBLMAX    ; Have we reached the upper limit?
                         DA   1E  0CD1  3610          BGEQU   5$                      ; Yes, return SS$_NOLOCKID
                    54   51   01   C1  0CD3  3611          ADDL3   #1,R1,R4                ; Incr. and save for later
                                      0CD7  3612
                                      0CD7  3613          ; Compute new table size and allocate it from pool.
                                      0CD7  3614
                51   00000000'GF   C0  0CD7  3615          ADDL    G^LCK$GL_IDTBLSIZ,R1    ; Add another increment to table size
                          51   04   C4  0CDE  3616          MULL    #4,R1                   ; Convert to size in bytes
                          51   0C   C0  0CE1  3617          ADDL    #12,R1                  ; Add header
                               62   16  0CE4  3618          JSB     (R2)                    ; Allocate it
                             C9 50   E9  0CE6  3619          BLBC    R0,10$                  ; Insuff. memory
                                      0CE9  3620
                                      0CE9  3621          ; Copy old table into new and deallocate old table.  Registers contain:
                                      0CE9  3622          ;       R1      Allocated size of new table
                                      0CE9  3623          ;       R2      Address of new table
                                      0CE9  3624          ;       R4      Old maximum lock id. + 1
                                      0CE9  3625
                               36   BB  0CE9  3626          PUSHR   #^M<R1,R2,R4,R5>        ; Save regs.
          55   00000000'GF   0C   C3  0CEB  3627          SUBL3   #12,G^LCK$GL_IDTBL,R5   ; Get starting address of old table
                         50    55   D0  0CF3  3628          MOVL    R5,R0                   ; Save in R0
                    53   65     FE 8F  78  0CF6  3629          ASHL    #-2,(R5),R3             ; Get size of old table in longwords
                              82   85  D0  0CFB  3630  20$:    MOVL    (R5)+,(R2)+             ; Move old table entry to new table
                                 FA 53  F5  0CFE  3631          SOBGTR  R3,20$                  ; Repeat
                              51    60   D0  0D01  3632          MOVL    (R0),R1                 ; Get size of old table
                          00000000'GF   16  0D04  3633          JSB     G^EXE$DEANONPGDSIZ      ; Deallocate old table
                                    36   BA  0D0A  3634          POPR    #^M<R1,R2,R4,R5>        ; Restore regs.
                                      0D0C  3635
                                      0D0C  3636          ; Set up header of new table and pointers to it.  Registers contain:
                                      0D0C  3637          ;       R1      Size of table
                                      0D0C  3638          ;       R2      Address of table
                                      0D0C  3639          ;       R4      Old maximum lock id. + 1
                                      0D0C  3640
                                62    51   D0  0D0C  3641          MOVL    R1,(R2)                 ; Store size in first longword
                                  08  A2   B4  0D0F  3642          CLRW    8(R2)                   ; Clear old size in word size field
                                  02  A2   B5  0D12  3643          TSTW    2(R2)                   ; Will size fit in a word?
                                      04   12  0D15  3644          BNEQ    30$                     ; No
                                08 A2     51   B0  0D17  3645          MOVW    R1,8(R2)                ; Yes, store it in normal place
                          00000000'GF     0C   A2  9E  0D1B  3646  30$:    MOVAB   12(R2),G^LCK$GL_IDTBL   ; Store pointer to table
                             00000000'GF      54   D0  0D23  3647          MOVL    R4,G^LCK$GL_NXTID       ; Store next lock id. to allocate
                                      51   10   C2  0D2A  3648          SUBL    #16,R1                  ; Compute new max. lock id. (# of
                                      51   04   C6  0D2D  3649          DIVL    #4,R1                   ; entries in table - 1)
                                50    FFFF 8F   3C  0D30  3650          MOVZWL  #^XFFFF,R0              ; Load useful constant (65535)
                                      50   51   D1  0D35  3651          CMPL    R1,R0                   ; Make sure we don't exceed 65535
                                           03   1B  0D38  3652          BLEQU   40$                     ; We're okay
                                      51   50   D0  0D3A  3653          MOVL    R0,R1                   ; Set number of entries to exactly 65535
                          00000000'GF      51   D0  0D3D  3654  40$:    MOVL    R1,G^LCK$GL_MAXID       ; Set maximum lock id.
                                53    0C A244   DE  0D44  3655          MOVAL   12(R2)[R4],R3           ; Point to first new entry
                                           54   D6  0D49  3656          INCL    R4                      ; Increment next lock id.
                                           50   D6  0D4B  3657          INCL    R0                      ; Change constant to ^X10000
                                                0D4D  3658
                                                0D4D  3659          ; Now initialize new section of table by storing linked list
                                                0D4D  3660          ; of lock id. indicies and sequence numbers.  Registers contain:
                                                0D4D  3661          ;       R0      Constant ^X10000
                                                0D4D  3662          ;       R1      Maximum lock id.
                                                0D4D  3663          ;       R3      Address of first new entry
                                                0D4D  3664          ;       R4      Next lock id. to store in table
```

```
                        0D4D  3665
                        0D4D  3666
54   50   C8            0D4D  3667 50$:    BISL    R0,R4                   ; Logically OR seq. num. with next id.
83   54   D0            0D50  3668         MOVL    R4,(R3)+                ; Store next table entry
          54   B6       0D53  3669         INCW    R4                      ; Incr. next id.
51   54   B1            0D55  3670         CMPW    R4,R1                   ; Compare with max. id
          F6   15       0D58  3671         BLEQ    50$                     ; Repeat
63   50   D0            0D5A  3672         MOVL    R0,(R3)                 ; Store last entry
50   01   D0            0D5D  3673         MOVL    S^#SS$_NORMAL,R0        ; Indicate success
               05       0D60  3674         RSB
                        0D61  3675
                        0D61  3676         .DSABL  LSB
```

```
                                                K 4
0D61  3677          .SBTTL  FREE_LKB - Free LKB (from AST queue)
0D61  3678
0D61  3679  ;++
0D61  3680  ; FUNCTIONAL DESCRIPTION:
0D61  3681  ;
0D61  3682  ;       This routine is called to free an LKB that is currently
0D61  3683  ;       queued as an ACB.  This should happen rarely, but when it does
0D61  3684  ;       an ACB is allocated from pool, the ACB portion of the LKB is copied
0D61  3685  ;       into the new ACB and the two ACBs are swapped on the AST queue.
0D61  3686  ;       This frees up the LKB for another use (such as a lock conversion).
0D61  3687  ;
0D61  3688  ; CALLING SEQUENCE:
0D61  3689  ;
0D61  3690  ;       BSBW    FREE_LKB
0D61  3691  ;       (Note: IPL must be at IPL$_ASTDEL or lower)
0D61  3692  ;
0D61  3693  ; INPUT PARAMETERS:
0D61  3694  ;
0D61  3695  ;       R4      Address of PCB
0D61  3696  ;       R6      Address of LKB
0D61  3697  ;
0D61  3698  ; OUTPUT PARAMETERS:
0D61  3699  ;
0D61  3700  ;       R0      Completion Code (returned to ERROR_EXIT - not caller)
0D61  3701  ;
0D61  3702  ; COMPLETION CODES:
0D61  3703  ;
0D61  3704  ;       SS$_INSFMEM             Insufficient memory
0D61  3705  ;       SS$_EXASTLM             Exceeded AST quota
0D61  3706  ;
0D61  3707  ; SIDE EFFECTS:
0D61  3708  ;
0D61  3709  ;       The LKB is removed from the AST queue.  Note that all registers
0D61  3710  ;       (including R0 and R1) must be preserved.
0D61  3711  ;
0D61  3712  ; NOTES:
0D61  3713  ;
0D61  3714  ;       This code makes two assumptions:
0D61  3715  ;
0D61  3716  ;       1)  That the LKB must be queued for a regular AST
0D61  3717  ;           (as opposed to just a special kernel AST).  This
0D61  3718  ;           is why AST quota is always deducted, not conditionally
0D61  3719  ;           on whether an AST address was specified.
0D61  3720  ;
0D61  3721  ;       2)  That the LKB$M_DCPLAST and LKB$M_DBLKAST bits cannot
0D61  3722  ;           become clear while we are at IPL 0.  Otherwise, it
0D61  3723  ;           is necessary to verify that the LKB is still in use
0D61  3724  ;           after the ACB is allocated from pool.  This assumption
0D61  3725  ;           is due to the fact that the AST must either be for
0D61  3726  ;           an outer mode or if for kernel mode then kernel mode
0D61  3727  ;           ASTs must be disabled.
0D61  3728  ;--
0D61  3729
0D61  3730          .IF NDF LOADSW
00000251  3731      .PSECT  Y$EXEPAGED
0251  3732          .ENDC
0251  3733
```

```
                     0251  3734 FREE_LKB:
            3F   BB  0251  3735          PUSHR   #^M<R0,R1,R2,R3,R4,R5>
         38 A4   B5  0253  3736          TSTW    PCB$W_ASTCNT(R4)            ; Test for enough AST quota
            50   15  0256  3737          BLEQ    80$                         ; Error - not enough
         51 34   3C  0258  3738          MOVZWL  #LKB$K_ACBLEN,R1            ; Size of ACB to allocate
 00000000'GF   16  025B  3739          JSB     G^EXE$ALLOCBUF              ; Allocate ACB
         49 50   E9  0261  3740          BLBC    R0,90$                      ; Error - insuff. memory
      0A A2 02   90  0264  3741          MOVB    #DYN$C_ACB,ACB$B_TYPE(R2)   ; Store data structure type
         38 A4   B7  0268  3742          DECW    PCB$W_ASTCNT(R4)            ; Decrement AST quota
                     026B  3743 10$:      SETIPL  95$                         ; Raise to IPL$_SYNCH and
                     0272  3744                                              ; lock pages in memory
                     0272  3745
                     0272  3746          ; If CVTTOSYS bit is set, then this LKB should be converted
                     0272  3747          ; to system owned.  Do it now instead of in LOCK_KAST.
                     0272  3748
            08   E1  0272  3749          BBC     #LKB$V_CVTTOSYS,-           ; Branch if CVTTOSYS is clear
      06 2A A6        0274  3750                  LKB$W_STATUS(R6),20$
 000001DB'GF   16  0277  3751          JSB     G^CVT_TO_SYS_INT            ; Convert to system owned
               AA  027D  3752 20$:     BICW    #LKB$M_DBLKAST-             ; Clear deliver blocking AST bit
                     027E  3753                  !LKB$M_CVTTOSYS,-           ; and convert to system owned bit
   2A A6   0102 8F       027E  3754                  LKB$W_STATUS(R6)
            52   DD  0283  3755          PUSHL   R2                          ; Save ACB address
      62    66   34  0285  3756          MOVC3   #LKB$K_ACBLEN,(R6),(R2)     ; Copy ACB portion of LKB
            52 8ED0  0289  3757          POPL    R2                          ; Restore ACB address
   0B A2    40 8F   88  028C  3758          BISB    #ACB$M_QUOTA,ACB$B_RMOD(R2) ; Set quota accounting flag
      0B A2 20   8A  0291  3759          BICB    #ACB$M_NODELETE,ACB$B_RMOD(R2) ; Clear nodelete flag
            20   A8  0295  3760          BISW    #LKB$M_NOQUOTA,-            ; Set NOQUOTA bit so that
         2A A2        0297  3761                  LKB$W_STATUS(R2)            ; enqueue quota is not credited
         55   56  D0  0299  3762          MOVL    R6,R5                       ; Address of LKB
 00000000'GF   16  029C  3763          JSB     G^SCH$SWAPACBS              ; Swap ACBs
            3F   BA  02A2  3764          POPR    #^M<R0,R1,R2,R3,R4,R5>
                     02A4  3765          SETIPL  #IPL$_ASTDEL                ; Lower IPL
                  05 02A7  3766          RSB
                     02A8  3767
50   2A04 8F   3C  02A8  3768 80$:     MOVZWL  #SS$_EXASTLM,R0
 00000543'EF   17  02AD  3769 90$:     JMP     ERROR_EXIT_R0
                     02B3  3770
           00000008  02B3  3771 95$:     .LONG   IPL$_SYNCH                  ; End of locked down code
                     02B7  3772          ASSUME  .-10$  LE  512              ; Must be on adjoining pages
                     02B7  3773
                     02B7  3774
                     02B7  3775          .END
```

```
ACB$B_RMOD                = 00000008
ACB$B_TYPE                = 0000000A
ACB$M_NODELETE            = 00000020
ACB$M_QUOTA               = 00000040
ACCVIO                      0000004C R      03
ACMODE                    = 00000028
ASTADR                    = 0000001C
ASTPRM                    = 00000020
BLKAST                    = 00000024
BUG$_DEQSUBLCKS             ********   X    03
BUG$_LKBREFNEG              ********   X    02
BUG$_LOCKMGRERR             ********   X    02
BUG$_RSBREFNEG              ********   X    02
BUG$_RSBREFNZRO             ********   X    02
CA$_MEASURE               = 00000002
CALC_BLK_SUBR               0000089F R      02
CANCEL                      00000A43 R      02
CANCELGRANT                 00000A3D R      02
CLEANUP1                    00000564 R      02
CLEANUP2                    00000578 R      02
CLEANUP3                    00000583 R      02
CLEANUP4                    0000058E R      02
CNX$ALLOC_CDRP              ********     X  02
CONVERSION                  00000049 R      02
CVT_TO_PRC                  00000208 R      02
CVT_TO_SYS                  000001CB R      02
CVT_TO_SYS_INT              000001DB R      02
DEPTH_ERROR                 00000504 R      02
DEQ_ACMODE                = 0000000C
DEQ_ALL                     00000174 R      03
DEQ_CONVERT                 00000AD7 R      02
DEQ_EXIT                    0000015E R      03
DEQ_FLAGS                 = 00000010
DEQ_GRANTED                 00000AF9 R      02
DEQ_WAIT                    00000AA9 R      02
DYN$C_ACB                 = 00000002
DYN$C_LKB                 = 00000035
DYN$C_RSB                 = 00000036
EFN                       = 00000004
ERROR_EXIT_R0               00000543 R      02
ERROR_EXIT_R11              00000540 R      02
EXE$ALOCBUF                 ********     X  03
EXE$ALONONPAGED             ********     X  02
EXE$ALONPAGWAIT             ********     X  03
EXE$ALONPAGWAITS            ********     X  02
EXE$C_CMSTKSZ               ********     X  02
EXE$DEANONPAGED             ********     X  02
EXE$DEANONPGDSIZ            ********     X  02
EXE$DEQ                     00000111 RG     03
EXE$ENQ                     0000000E RG     03
EXE$GL_ABSTIM               ********     X  02
EXE$MAXACMODE               ********     X  03
FLAGS                     = 00000010
FREE_LKB                    00000251 R      03
INVALID_STATE               00000A33 R      02
IOC$GL_SRPFL                ********     X  03
IOC$GL_SRPSIZE              ********     X  03

IPL$_ASTDEL               = 00000002
IPL$_SYNCH                = 00000008
JIB$W_ENQCNT              = 0000004C
LCK$CANCEL_CVT              000009E8 RG     02
LCK$CHECK_RSB               00000C18 RG     02
LCK$CHECK_STALL             00000C87 RG     02
LCK$COMPAT_TBL              00000000 RG     02
LCK$COMP_GGMODE             000008AF RG     02
LCK$CVTNOTQED               00000194 RG     02
LCK$CVT_GRANTED             0000016B RG     02
LCK$DEALLOC_RSB             00000C31 RG     02
LCK$DEQLOCK                 00000A85 RG     02
LCK$EXTEND_IDTBL            00000CB3 RG     02
LCK$EXTEND_IDTBLW           00000CBC RG     02
LCK$GB_HTBLSHFT             ********     X  02
LCK$GB_MAXDEPTH             ********     X  02
LCK$GB_STALLREQS            ********     X  02
LCK$GL_DIRVEC               ********     X  02
LCK$GL_HASHTBL              ********     X  02
LCK$GL_IDTBL                ********     X  02
LCK$GL_IDTBLMAX             ********     X  02
LCK$GL_IDTBLSIZ             ********     X  02
LCK$GL_MAXID                ********     X  02
LCK$GL_NXTID                ********     X  02
LCK$GL_TIMOUTQ              ********     X  02
LCK$GL_WAITTIME             ********     X  02
LCK$GRANTCVTS               000008D2 RG     02
LCK$GRANTWTRS               0000091B RG     02
LCK$GRANT_LOCK              0000060B RG     02
LCK$GRANT_LOCK_ALT          00000610 RG     02
LCK$GRANT_REM               0000065D RG     02
LCK$HASH_SEARCH             0000059C RG     02
LCK$K_CRMODE              = 00000001
LCK$K_CWMODE              = 00000002
LCK$K_EXMODE              = 00000005
LCK$K_NLMODE              = 00000000
LCK$K_PRMODE              = 00000003
LCK$K_PWMODE              = 00000004
LCK$LOCAL_CVT               0000010F RG     02
LCK$LOCAL_LOCK              000003D7 RG     02
LCK$M_CANCEL              = 00000002
LCK$M_CONVERT             = 00000002
LCK$M_CVTSYS              = 00000040
LCK$M_INVVALBLK           = 00000004
LCK$M_NOQUEUE             = 00000004
LCK$M_NOQUOTA             = 00000020
LCK$M_PROTECT             = 00000100
LCK$M_RECOVER             = 00000080
LCK$M_SYNCSTS             = 00000008
LCK$M_SYSTEM              = 00000010
LCK$NORET_VALBLK            000004FB RG     02
LCK$NOT_QUEUED              0000050D RG     02
LCK$QUEUECVT                000007AE RG     02
LCK$QUEUED_EXIT             000004F8 RG     02
LCK$QUEUEWAIT               000007C8 RG     02
LCK$QUEUE_BLKAST            00000878 RG     02
LCK$QUEUE_BLOCKAST          0000082D RG     02
```

```
LCK$QUEUE_REM                   000007CD RG    02
LCK$REGRANTLOCK                 00000623 RG    02
LCK$RET_VALBLK                  000004D8 RG    02
LCK$SND_BLKING                  ******** X     02
LCK$SND_CVTREQ                  ******** X     02
LCK$SND_DEQCV                   ******** X     02
LCK$SND_DEQGR                   ******** X     02
LCK$SND_DEQWT                   ******** X     02
LCK$SND_GRANTED                 ******** X     02
LCK$SND_LOCKREQ                 ******** X     02
LCK$SND_RMVDIR                  ******** X     02
LCK$SRCH_HSHTBL                 000005E4 RG    02
LCK$SYNCCVT_TBL                 00000006 RG    02
LCK$SYNC_EXIT                   000004C3 RG    02
LCK$V_CONVERT                 = 00000001
LCK$V_CVTSYS                  = 00000006
LCK$V_DEQALL                  = 00000000
LCK$V_NODLCKWT                = 00000009
LCK$V_NOQUEUE                 = 00000002
LCK$V_NOQUOTA                 = 00000005
LCK$V_PROTECT                 = 00000008
LCK$V_RECOVER                 = 00000007
LCK$V_VALBLK                  = 00000000
LKB$B_EFN                     = 00000037
LKB$B_GRMODE                  = 00000035
LKB$B_RMOD                    = 0000000B
LKB$B_RQMODE                  = 00000034
LKB$B_STATE                   = 00000036
LKB$B_TSLT                    = 0000004E
LKB$B_TYPE                    = 0000000A
LKB$K_ACBLEN                  = 00000034
LKB$K_CONVERT                 = 00000000
LKB$K_GRANTED                 = 00000001
LKB$K_LENGTH                  = 00000060
LKB$K_WAITING                 = FFFFFFFF
LKB$L_AST                     = 00000010
LKB$L_ASTPRM                  = 00000014
LKB$L_ASTQFL                  = 00000000
LKB$L_BLKASTADR               = 00000020
LKB$L_CPLASTADR               = 0000001C
LKB$L_DUETIME                 = 00000018
LKB$L_KAST                    = 00000018
LKB$L_LKID                    = 00000030
LKB$L_LKSB                    = 00000024
LKB$L_LKST1                   = 0000002C
LKB$L_OLDASTPRM               = 00000058
LKB$L_OLDBLKAST               = 0000005C
LKB$L_OWNQFL                  = 00000040
LKB$L_PARENT                  = 00000048
LKB$L_PID                     = 0000000C
LKB$L_RSB                     = 00000050
LKB$L_SQFL                    = 00000038
LKB$M_ASYNC                   = 00000004
LKB$M_BLKASTQED               = 00000008
LKB$M_CVTTOSYS                = 00000100
LKB$M_DBLKAST                 = 00000002
LKB$M_DCPLAST                 = 00000001
LKB$M_KAST                    = 00000080
LKB$M_MSTCPY                  = 00000010
LKB$M_NODELETE                = 00000020
LKB$M_NOQUOTA                 = 00000020
LKB$M_PKAST                   = 00000010
LKB$M_PROTECT                 = 00000200
LKB$M_TIMOUTQ                 = 00000040
LKB$M_WASSYSOWN               = 00000080
LKB$S_MODE                    = 00000002
LKB$V_ASYNC                   = 00000002
LKB$V_BLKASTQED               = 00000003
LKB$V_CVTTOSYS                = 00000008
LKB$V_DBLKAST                 = 00000001
LKB$V_DCPLAST                 = 00000000
LKB$V_MODE                    = 00000000
LKB$V_MSTCPY                  = 00000004
LKB$V_NODELETE                = 00000005
LKB$V_NOQUOTA                 = 00000005
LKB$V_PROTECT                 = 00000009
LKB$V_TIMOUTQ                 = 00000006
LKB$V_WASSYSOWN               = 00000007
LKB$W_FLAGS                   = 00000028
LKB$W_REFCNT                  = 0000004C
LKB$W_SIZE                    = 00000008
LKB$W_STATUS                  = 0000002A
LKMODE                        = 00000008
LKSB                          = 0000000C
LOCKID                        = 00000004
LOCK_KAST                       0000070A R     02
NEW_LOCK                        0000005C R     03
NEW_RESOURCE                    00000433 R     02
NOCDRP                          00000AC2 R     02
OLD_RESOURCE                    000003C1 R     02
PARID                         = 00000018
PCB$L_JIB                     = 00000080
PCB$L_LOCKQBL                 = 00000108
PCB$L_LOCKQFL                 = 00000104
PCB$L_PID                     = 00000060
PCB$L_STS                     = 00000024
PCB$Q_PRIV                    = 00000084
PCB$V_RECOVER                 = 0000001A
PCB$W_ASTCNT                  = 00000038
PCB$W_GRP                     = 000000BE
PMS$GL_BLK_LOC                  ******** X     02
PMS$GL_DEQ_LOC                  ******** X     03
PMS$GL_ENQCVT_LOC               ******** X     02
PMS$GL_ENQNEW_LOC               ******** X     02
PMS$GL_ENQNOTQD                 ******** X     02
PMS$GL_ENQWAIT                  ******** X     02
POOL_MASK                     = 0000000F
PR$_IPL                       = 00000012
PRI$_RESAVL                   = 00000002
PROT                          = 0000002C
PRV$V_SYSLCK                  = 0000001E
PSL$C_EXEC                    = 00000001
PSL$S_PRVMOD                  = 00000002
PSL$V_PRVMOD                  = 00000016
```

```
QUEUE_AST                       000006AE R      02
QUEUE_BLKAST                    0000087D R      02
QUEUE_COMMON                    000007D8 R      02
REFCNT_ERROR                    00000A37 R      02
REM_LOCK                        0000042D R      02
RESNAM                        = 00000014
RSB$B_CGMODE                  = 0000000D
RSB$B_DEPTH                   = 0000000B
RSB$B_GGMODE                  = 0000000C
RSB$B_RMOD                    = 0000004E
RSB$B_RSNLEN                  = 0000004F
RSB$B_TYPE                    = 0000000A
RSB$K_LENGTH                  = 00000050
RSB$K_MAXLEN                  = 0000001F
RSB$L_CSID                    = 00000038
RSB$L_CVTQBL                  = 0000001C
RSB$L_CVTQFL                  = 00000018
RSB$L_GRQFL                   = 00000010
RSB$L_HSHCHN                  = 00000000
RSB$L_HSHCHNBK                = 00000004
RSB$L_PARENT                  = 00000048
RSB$L_VALSEQNUM               = 0000003C
RSB$L_WTQBL                   = 00000024
RSB$L_WTQFL                   = 00000020
RSB$M_DIRENTRY                = 00000001
RSB$M_VALINVLD                = 00000002
RSB$Q_VALBLK                  = 00000028
RSB$T_RESNAM                  = 00000050
RSB$W_BLKASTCNT               = 00000042
RSB$W_GROUP                   = 0000004C
RSB$W_HASHVAL                 = 00000044
RSB$W_REFCNT                  = 00000040
RSB$W_RQSEQNM                 = 00000046
RSB$W_SIZE                    = 00000008
RSB$W_STATUS                  = 0000000E
RSN$_CLUSTRAN                 = 0000000E
RSN$_NPDYNMEM                 = 00000003
SCH$CLREFR                      ********    X   02
SCH$GETEFC                      ********    X   03
SCH$GL_CURPCB                   ********    X   02
SCH$GL_PCBVEC                   ********    X   02
SCH$POSTEF                      ********    X   02
SCH$QAST                        ********    X   02
SCH$REMOVACB                    ********    X   02
SCH$RWAIT                       ********    X   02
SCH$SWAPACBS                    ********    X   03
SNDDEQ_GRNT                     00000ACE R      02
SNDDEQ_WAIT                     00000A65 R      02
SS$_ABORT                     = 0000002C
SS$_ACCVIO                    = 0000000C
SS$_BADPARAM                  = 00000014
SS$_CANCEL                    = 00000830
SS$_CANCELGRANT               = 00000E2A
SS$_CVTUNGRANT                = 0000213C
SS$_EXASTLM                   = 00002A04
SS$_EXDEPTH                   = 00000E1A
SS$_EXENQLM                   = 00002A44
SS$_INSFMEM                   = 00000124
SS$_IVBUFLEN                  = 0000034C
SS$_IVLOCKID                  = 00002124
SS$_NOLOCKID                  = 00000E12
SS$_NOPRIV                    = 00000024
SS$_NORMAL                    = 00000001
SS$_NOSYSLCK                  = 000028F4
SS$_NOTQUEUED                 = 000009B8
SS$_PARNOTGRANT               = 00002134
SS$_PARNOTSYS                 = 0000225C
SS$_RETRY                     = 00000E32
SS$_SUBLOCKS                  = 0000212C
SS$_SYNCH                     = 00000689
SS$_VALNOTVALID               = 000009F0
STALL_REQ                       00000C90 R      02
VALBLK                        = 00000008
VERIFYLOCKID                    00000968 R      02
VERIFYPARLOCKID                 0000096C R      02
WAIT_COM                        00000C93 R      02
WAIT_FOR_POOL                   00000C82 R      02
```

Psect synopsis

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
ABS	00000000 (0.)	01 (1.)	NOPIC USR CON ABS LCL NOSHR EXE RD WRT NOVEC BYTE
LOCKMGR	00000D61 (3425.)	02 (2.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC LONG
Y$EXEPAGED	000002B7 (695.)	03 (3.)	NOPIC USR CON REL LCL NOSHR EXE RD WRT NOVEC BYTE

Performance indicators

Phase	Page faults	CPU Time	Elapsed Time
Initialization	29	00:00:00.06	00:00:01.15
Command processing	107	00:00:00.55	00:00:03.75
Pass 1	493	00:00:20.32	00:00:58.45
Symbol table sort	4	00:00:02.47	00:00:06.45
Pass 2	408	00:00:08.00	00:00:26.62
Symbol table output	1	00:00:00.25	00:00:00.40
Psect synopsis output	0	00:00:00.02	00:00:00.02
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	1044	00:00:31.69	00:01:36.86

The working set limit was 2100 pages.
125025 bytes (245 pages) of virtual memory were used to buffer the intermediate code.
There were 90 pages of symbol table space allocated to hold 1421 non-local and 220 local symbols.
3775 source lines were read in Pass 1, producing 35 object records in Pass 2.
30 pages of virtual memory were used to define 29 macros.

Macro library statistics

Macro library name	Macros defined
_255DUA28:[SYS.OBJ]LIB.MLB;1	17
_255DUA28:[SYSLIB]STARLET.MLB;2	9
TOTALS (all libraries)	26

1443 GETS were required to define 26 macros.

There were no errors, warnings or information messages.

```
MACRO/LIS=LIS$:SYSENQDEQ/OBJ=OBJ$:SYSENQDEQ MSRC$:SYSENQDEQ/UPDATE=(ENH$:SYSENQDEQ)+EXECML$/LIB
```

SYSCRMPSC
LIS

SYSDCLEXH
LIS

SYSDEVALC
LIS

SYSCVTIM
LIS

SYSDGBLSC
LIS

SYSENQDEQ
LIS

SYSDCLCMH
LIS

SYSDERLMB
LIS

SYSDASSGN
LIS

SYSDELPRC
LIS

SYSGETJPI
LIS

SYSERAPAT
LIS

SYSFAO
LIS

SYSGETDVI
LIS

SYSEXIT
LIS

SYSEVTSRV
LIS

SYSFORCEX
LIS